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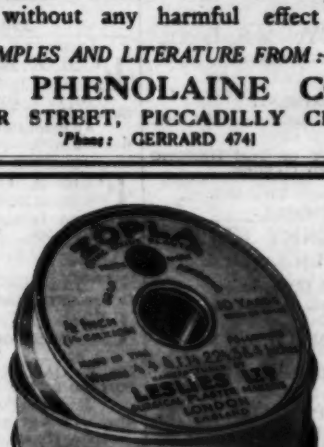

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ADDRESSES AND ORIGINAL ARTICLES

THE RÔLE OF THE LIVER IN THE METABOLISM OF CARBOHYDRATE AND FAT *

By C. H. Best, M.D., D.Sc. Lond., F.R.C.P. Canada
PROFESSOR OF PHYSIOLOGY IN THE UNIVERSITY OF TORONTO

I.—METHODS OF APPROACH TO THE PROBLEM

A time-honoured and very useful method of approach to a physiological problem such as that which I will discuss to-day is to remove the organ in question and to investigate the metabolic processes in the preparation thus produced.

In 1886 Minkowski removed the liver from geese, which are conveniently constructed for this operation, since the renal-portal vein anastomosing with the inferior vena cava by means of the circle of Jacobson provides a passage for the return of blood from the alimentary tract after the portal vein has been ligated. The liver can be removed without damaging the vena cava. It was soon realised, however, that certain metabolic changes in these birds are quite different from those of mammals, and the need for study of dehepatised mammals became even more apparent. The Eck fistula was introduced by the Russian surgeon whose name we associate with this procedure. The technique was popularised by Pavlov, and in his hands yielded very useful results in a field outside our immediate interest. The creation of this fistula is, of course, one of the essential steps in some of the techniques now used. The development of the modern method for complete removal of the liver is due very largely to F. C. Mann and his pupils. Some useful modifications of Mann's three-stage procedure have been introduced. We now prefer the single-stage operation recently described by Markowitz and Yater, who were for some time Mann's pupils, which utilises a number of steps introduced by various previous investigators. Completely dehepatised dogs have been and still are extremely useful in studies of carbohydrate and fat metabolism in which an unanæsthetised liverless preparation with central nervous system and pancreas intact is desired.

A large proportion of the information gained up to the present has been secured in animals dehepatised by Mann's three-stage operation. The problem in complete hepatectomy is the return of the portal blood, and that which normally flows through the hepatic portion of the vena cava, to the heart. The liver cannot be removed from mammals without including this portion of the vena cava. In Mann's method an artificial "caput medusæ," or pattern of collateral veins such as that seen on the abdomen in cases of chronic portal obstruction, is produced by gradually creating an impediment to the return of blood through the vena cava and portal vein. His first step is to make a reverse Eck fistula and to force caval blood through the liver by ligating the vena cava. An increased venous pressure is built up and anastomotic channels expand and carry much of the load. Some of these vessels are visible on the abdomen, but a large part of the blood may pass by way of the deep lumbar and azygos veins. Some six weeks later the portal vein is tied off and still further enlargement of the collaterals is produced. Hepatectomy may be performed at any subsequent time. This consists merely of ligating (1) the structures in the gastro-hepatic omentum, and (2) the sub-diaphragmatic vena cava. The liver can then be easily removed. The creation of the Eck fistula is the only difficult part of this operation. Markowitz and Soskin, working in Toronto, partially occluded the portal vein and vena cava by linen ligatures at one operation, and subsequently, after the collateral circulation had developed, obstructed these vessels completely and removed the liver. This two-stage method has provided useful preparations in the hands of many of us and enables hepatectomy to be performed in various small animals (cats, rabbits, guinea-pigs) in which the establishment of an Eck fistula is not practicable. In 1929 Firor and Stinson [1] described a one-stage operation for removing the liver. The vena cava was cannulated below the liver and the portal vein and cava were joined by a Y-shaped pyrex glass cannula below the caval cannula. These investigators introduced this very useful procedure of substituting a hard glass cannula of wide bore for the hepatic vena cava. There is no clotting in the cannula, and this procedure apparently introduces no new difficulties. One would, of course, prefer not to use this cannula if studies in the rate of clotting, &c., were being made in the dehepatised animal. Markowitz, Yater, and Burrows [2] utilise this pyrex glass cannula in their method which, in so far as my personal experience with it goes, offers an excellent means of obtaining completely dehepatised dogs for physiological studies. The blood loss and interference with the circulation are less than in the other procedures. I will attempt to describe this technique in as few words as possible.

The first step after the abdomen is opened is to expose the vena cava and portal vein by collecting the intestines in a fold of the duodenal mesentery which is then drawn to the animal's left side. The inferior vena cava is freed from its attachment at a point just below where it becomes buried in the liver. A stout ligature is tied around the cava and over a small brass rod, the function of which is to protect the vessel when this ligature is cut. The glass cannula is then inserted and secured. The occluded vena cava is then released. This very simple step is useful for complete removal of the liver in eviscerated preparations. The next step is to prepare the Eck fistula. This is a most interesting technique which in its present form is due in large part to Fischler and Schröder. The idea is to create a water-tight casement surrounding a cutting suture. The first row of sutures is laid and the cutting thread introduced, and the two vessels are sewn together over the line of the cutting thread by a second row of sutures. One then grasps the two ends of the cutting thread and saws through the adjoining walls of the two vessels. There is usually little or no hæmorrhage. The structures in the gastro-hepatic omentum are ligated and several ligatures are tied around the vena cava and the cannula above the liver. The liver is then removed in one piece.

Carbohydrate Metabolism in Dehepatised Animals

The dehepatised animals make a rapid recovery from the operation, and within an hour of the placing of the last suture they may run about and respond to call. At the end of the second hour, however, they are much less alert. The muscles may twitch. There may be generalised convulsions, coma, and death. This is the picture described by Mann and Magath and associated by them with hypoglycæmia. Incidentally, this description furnished the clue to the cause of the effects of an overdose of insulin. The improvement in the condition of these dehepatised animals brought about by the administration of sugar was the first convincing demonstration that

* Three lectures delivered for the University of London at University College on Jan. 11th, 15th, and 18th. Lectures II. and III. will appear in forthcoming issues.

consciousness, the well-being and life of a mammal, depends on the maintenance of a certain tension of sugar in the blood. Bock and Hoffmann, and Pavy and Siau, had noted hypoglycæmia in anæsthetised dehepatised preparations, and numerous other observers found this to occur when the pancreas had also been extirpated (see Macleod, 1926).[3]

The amount of dextrose necessary to maintain these animals in good condition varies somewhat, but the rate of injection should be such as to provide approximately one-quarter of a gramme per kilogramme per hour. If the liverless animal is exercised Mann and Magath found that the sugar requirement is considerably greater. Dehepatised, depancreatised dogs have also been found by Yater, Markowitz, and Cahoon to require large amounts of sugar. In general they need somewhat less than animals with the pancreas intact. Sugars other than dextrose are relatively ineffective, but I will not discuss this subject in detail.

These experimental results provide excellent evidence that one of the important functions of the liver is to manufacture sugar. In the absence of the liver, no means exist by which the concentration of the sugar of the blood can be raised other than by giving sugar. We know, of course, from Corkill's extension of Cori's work, that muscle glycogen may be broken down by adrenaline in functionally dehepatised animals, but the lactic acid formed is not changed into dextrose which is available to replenish the blood-sugar. It is well established that insulin accelerates the fall in blood-sugar in these preparations, but a discussion of that field is perhaps only on the fringe of my subject. It is dangerous to attribute the decreased susceptibility to insulin which is exhibited by these dehepatised animals (Markowitz, Mann, and Bollman) to any one factor, since so many metabolic disturbances have been produced. Himsworth's stimulating and closely reasoned argument in favour of the existence of an "insulin-kinase" merits serious consideration, but since there is as yet no direct evidence for the presence of this material in tissues a further discussion of the points he has raised is unnecessary. My reason for mentioning this work here is that the facts at present available have led Himsworth to suggest that this hypothetical "insulin-kinase" may be made in the liver.

Phosphate Metabolism in Dehepatised Animals

The effect on the inorganic phosphate of normal blood and urine which follows the injection of dextrose, or the production of hyperglycæmia by other means, apparently acts through liberation of insulin, since Markowitz, and more recently Waters, have been unable to detect the effect in depancreatised dogs. The responses of inorganic phosphate of the blood to insulin in the functionally dehepatised animal were studied by Best, Hoet, and Marks. The decrease is easily demonstrable in these preparations and therefore is certainly not wholly dependent on the liver. Dr. E. T. Waters, in my department, has been studying the effect of varying the rate of sugar injection in dehepatised dogs on blood phosphate. The results are essentially the same as those secured in functionally dehepatised cats. If dextrose is administered intermittently in large doses to these animals the inorganic phosphate may be reduced to and maintained at very low levels, and the conclusion might have been reached that absence of the liver was responsible for this state of affairs. If the necessary amount of dextrose to keep the blood-sugar approximately normal is supplied by continuous slow infusion the inorganic phosphate is within normal limits, and soon after dehepatisation the characteristic drop can be secured by increasing the rate of sugar infusion or by giving insulin.

One may remark here that the recent suggestion of Davis, Luck, and Miller,[4] that the part of the insulin molecule which affects blood phosphate is more resistant to soft X rays than that which produces hypoglycæmia, leaves one unconvinced that this is really the case.

Calorigenic Action of Adrenaline and the Liver

It is well known that adrenaline causes a rise in the resting metabolic rate of normal animals (Boothby), but as this effect apparently is not demonstrable in mammals after hepatectomy (Soskin) we may ascribe it in large part to an action on the liver. The discharge of dextrose formed from liver glycogen or from the lactate made available from muscle glycogen, and an increase in O_2 consumption of the liver itself are the factors to be considered, but their relative importance is undecided.

Respiratory Quotient of Dehepatised Animals

The resting respiratory quotient of the liverless animal is about 0·85. When glucose is administered intravenously it has been reported that the quotient rises promptly to approximately unity (Markowitz). These animals apparently breathe quite normally, but as blood and muscle CO_2 were not investigated judgment on the significance of this result must be reserved.

The respiratory quotient of the eviscerated preparation has been discussed recently by several workers (Irving; Kilborn; Peterson). There seems to be no doubt that it is usually much lower than unity, even when carbohydrate is administered. When insulin as well as carbohydrate is given, in our experience, the quotient is about 1. I will take this opportunity of bringing to your attention the findings of Irving, Foster, and myself, that the eviscerated spinal dog which is receiving both sugar and insulin has a quotient, corrected for changes in CO_2 of blood and muscle, of approximately 1. It is therefore, perhaps, permissible to calculate the sugar combustion of the eviscerated spinal animal receiving carbohydrate and insulin, on the basis that the O_2 is devoted exclusively to oxidation of carbohydrate (Table I. †). Irving, Foster, and I feel that these balances are reasonably satisfactory, and do not suggest the formation of carbohydrate compounds

TABLE I.—*Summary of Experiments*

—		Nov. 24th.		Dec. 1st.		Dec. 29th.		Jan. 20th.	
		+	−	+	−	+	−	+	−
Glucose injected		..	11·78	..	12·33	..	12·15	..	11·86
Glucose oxidised		3·88	..	4·51	..	3·63	..	4·57	..
Blood-sugar		0·35	..	..	0·57	0·84	..	0·09	..
Muscle	Sugar	..	0·09	..	1·45	6·25	..	0·22	..
	Glycogen	7·11	..	13·57	..	0·37	..	6·32	..
	Lactic acid	0·80	..	..	0·08	0	0	..	0·09
Skin sugar		0·25	..	..	1·83	0·77	..	..	0·20
Liver	Sugar	0	0	0·11	..	..	..	..	0·11
	Glycogen	..	0·46	..	1·20	R.	..	..	0·56
Totals		12·39	12·27	18·19	17·46	11·86	12·15	11·20	12·84
Differences		0·12 over.	..	0·73 over.	..	..	0·29 under.	..	1·64 under.

R. = removed.

† Reproduced from Proc. Roy. Soc. Canada, 1931.

other than glycogen by insulin under these particular conditions (suprarenals extirpated).

I may say that the determination of the respiratory quotient under any circumstances yields me very little satisfaction, since its interpretation is always in doubt. However, one must be allowed to make calculations such as these from experimental results obtained in a variety of ways. It may be slightly reassuring to some people that, when a preparation from which the principal organ, where conversions of food materials resulting in a low quotient might take place, has been removed and a carbohydrate plethora in the presence of an excess of insulin has been established, the ratio of $\frac{CO_2}{O_2}$ suggests either that carbohydrate oxidation exclusively is occurring, or that with or without some oxidation of carbohydrate sugar is being changed to fat, and some other process giving a lower quotient is also proceeding. The statement that there is no direct evidence of fat formation from sugar under these or similar conditions means nothing, since the amount of fat which might be formed could not be detected.

TABLE II.—*Spontaneous Hypoglycæmia or Increased Susceptibility to Insulin*

HYPERINSULINISM (Hyperactivity or tumour of islands of Langerhans)	INTERFERENCE WITH GLUCONEOGENESIS IN LIVER	HYPOFUNCTION OF ANTERIOR PITUITARY, ADRENALS, OR THYROID
	In Experimental Animals	
Hypertrophy after duct ligation. " " ant. pit. extracts ? No tumours carefully studied.	Hepatectomy. Interference with arterial blood flow. Poisoning: Phosphorus, Chloroform, Hydrazine, Synthalin, &c., &c. Deposition of fat.	Removal of pituitary (anterior lobe). Removal of adrenals. Removal of thyroid.
	Clinical Observations	
Cases of hyperplasia and hypertrophy. Cases of tumour.	Interference with arterial blood flow. Hepatitis. Carcinomata. Yellow fever. Acute yellow atrophy. Poisoning: Phosphorus, Carbon tetrachloride, Benzol, Chloroform, Synthalin, &c., &c.	Hypoglycæmia in so-called pituitary cachexia or Simmonds's disease. Hypoglycæmia in Addison's disease (some cases). Increased susceptibility to insulin after thyroidectomy.

Other causes of hypoglycæmia.—Excessive utilisation of sugar by muscles (dogs in treadmill, marathon runners). Exhaustion of carbohydrate reserves by thyroid feeding (with possibly also hyperactivity of islands of Langerhans) or, in some species, by fasting.

Spontaneous Hypoglycæmia

I may perhaps be allowed to interrupt this description of methods by referring briefly to the interesting subject of spontaneous hypoglycæmia. The rate of sugar production by the liver is the central factor in this problem. Under certain circumstances hypoglycæmia may be due to excessive utilisation of dextrose (prolonged muscular exercise) but is usually produced by a diminished rate of discharge of sugar from the hepatic vein. The three main factors in the production of this effect appear to be (1) damage to the liver cells, (2) excessive inhibition of gluconeogenesis by insulin, and (3) decreased gluconeogenesis attributable to hypofunction of the anterior pituitary, adrenals, or thyroid. I have listed under three headings some of the causes of experimental and clinical hypoglycæmia (Table II.). Direct interference with sugar formation in the liver quite appropriately occupies the central position. Some of the conditions which may produce this effect by damage to the liver cells have been listed, but no attempt has been made to make this list complete. A complete survey of this aspect of the subject has not to my knowledge been made. When there is no damage to liver cells, hypoglycæmia may be observed as a result of an excess of insulin, or, on the other hand, it may be produced by a subnormal activity of the anterior pituitary, the adrenals, or the thyroid. This question will be discussed from another point of view in the next lecture, but it is well established that removal of the anterior pituitary may result in hypoglycæmia (toads, dogs, and rabbits), that removal of the adrenal medulla increases the sensitivity of the animal to insulin, and that in some species hypoglycæmia attributable to adrenal cortex insufficiency is observed. The increased effect of insulin in thyroidectomised animals is also, of course, well known. Clinical counterparts of these experimentally produced conditions are also available. The evidence which is very rapidly accumulating suggests that the anterior pituitary is capable of exerting by direct action on the liver a greater effect on new formation of sugar than these other glands, and it may follow from this that hypofunction of this gland more frequently results in decreased sugar formation and hypoglycæmia. It will be obvious from this short discussion that spontaneous hypoglycæmia may be produced without there being any evidence of excessive insulin liberation from the pancreas. While it is possible for the clinician to determine in most cases whether or not the liver is severely damaged, and also to identify cases in which there is extensive involvement of the adrenals or thyroids, it is quite likely that hypofunction of the anterior pituitary might escape attention. It would be preferable to reserve the term "hyperinsulinism" for cases in which tumours of the islands of Langerhans or extensive hyperplasia and hypertrophy of these glands has been demonstrated (Harris [5]). As will be seen from Table III., which Dr. C. Aberhart has been good enough to prepare for me, in nearly half the cases of spontaneous hypoglycæmia in which an operation has been performed, no lesion of the pancreas (or

TABLE III.—*Spontaneous Hypoglycæmia*

Case reports consulted	60
Cases in which operation was performed	13
Cases in which tumour was found (Wilder, 1927; Howland, 1929; Wormack, 1929; Carr, 1930; Mayo, 1931; Mayo, 1931; Derrick, 1930.)	7
Results of removal of tumour:—	
Great improvement reported in (Howland, Wormack, Carr, Mayo.) Data not available for other cases.	4
Cases with no detectable pancreatic lesion (Finney, Holman, Allan, 2, Mayo, 2.)	6
Cases without tumour in which partial pancreatectomy performed	6
Results of partial pancreatectomy—	
Reports of improvement unconvincing	1
No improvement reported	5

liver) has been detected. While it is possible, as has been suggested, that a small tumour might escape attention, it is by no means clear that the history of the development of the surgical treatment of hyperthyroidism will be repeated in this instance. From the point of view of the physiologist it would appear more rational to attempt to increase gluconeogenesis by administering a suitable extract of the anterior lobe of the pituitary, if this should be made available, rather than to attempt to remove sufficient pancreas so that the amount of insulin liberated is reduced to compensate for an inadequate supply of the diabetogenic substance of the anterior pituitary. The evidence which suggests that this diabetogenic substance acts in part at least by a direct stimulation of the liver to produce sugar will be reviewed in the next lecture. The rational treatment of these cases at present consists in: (1) Supplying carbohydrate. (2) Stimulating new production of carbohydrate. Liberation of stored glycogen can only have a transient effect. Some success has been secured by thyroid therapy, but here the increased production of sugar by the liver may be negatived by the increased consumption of sugar which thyroxine also produces. (3) By the surgical removal of a tumour, if it should be present. To this list there may shortly be added the use of a potent diabetogenic substance prepared from the anterior pituitary. If, as may well be the case, the therapeutic effects of the extract from the anterior lobe are not satisfactory, the clinician will probably be forced in severe cases of spontaneous hypoglycæmia to recommend excision of a large part of the pancreas irrespective of whether or not the presence of adenoma is suspected.

Fat Metabolism in Dehepatised Animals

There is considerable evidence that the liver plays an important rôle in the metabolism of fat. Among his many contributions to physiology, the late Prof. Embden (Embden and Kalberlah)[6] noted that the perfused liver formed acetone from straight chained fatty acids with an even number of carbon atoms. This provided excellent support for Knoop's theory of β-oxidation. The acids with an odd number of carbon atoms apparently are not naturally occurring and therefore need not be considered.

Any worth-while discussion of β-oxidation with a consideration of the contributions of Dakin, and the more recent ones of Raper and his collaborators, and of Quick, would require a large part of the lecture hour and should be discussed by someone with greater experience in that field than I. Since ketone bodies exist in small quantities in the blood of normal animals, there is an increasing tendency to consider that these are normal products of the breakdown of fatty acids. The experimental results available at present suggest, but do not prove, that the ketone bodies are made exclusively by the liver. If hepatectomy is performed on a depancreatised dog which is exhibiting a profound ketosis, the concentration of these substances in the blood begins to fall immediately (Chaikoff and Soskin).[7] This finding suggests that the ketosis of diabetes is not chiefly due to diminished utilisation of ketone bodies, but rather to excessive production, as is apparently the case with sugar. When sodium aceto-acetate is administered intravenously to dehepatised dogs, large quantities of beta-hydroxy-butyric acid appear in the blood stream. The concentration of this latter substance diminishes rapidly. When the lævo salt of beta-hydroxy-butyric acid is injected into these animals this substance is utilised without the appearance of aceto-acetic acid. (Markowitz, unpublished observations.)

The time is not yet ripe for an attempt to correlate these findings with the results of liver perfusions in which the ketone bodies have been added to the circulating blood or with those of in-vitro experiments on the oxidation of the fatty acids.

The evidence that dehepatised animals utilise fat normally is largely based on the carefully controlled experiments of Drury and McMaster.[8] The fate of their interpretation, like that of many another contribution, depends on the meaning which may be attached to an R/Q which is in the neighbourhood of 0·7. The fact that the quotient in fat fed animals remains at this low level after removal of the liver presumably indicates either that resting muscle tissue utilises fat directly or that sugar is formed from fat in the liverless preparation. The former interpretation has the advantage of simplicity, and while the frequent attempts to obtain direct evidence have thus far consistently failed, the great difficulties inherent in this type of experiment should of course be appreciated.

Liver Function Tests

The interpretation of many of the liver function tests has been quite recently discussed from a physiological point of view by Green, Snell, and Walters, by Mann and Bollman,[9] and by Poulsson. It is perhaps worth while emphasising again that the liver may respond normally to several of the function tests and yet yield an abnormal result to another one. One difficulty, of course, in the interpretation of the results of these tests is the uncertainty that we are dealing with the function of the liver cells alone. The second difficulty is that many of these liver function tests may yield a normal result when only a fraction of the normal amount of liver tissue is present in the animal. From the physiological point of view the uric acid function test has certain advantages. Uric acid is apparently dealt with only by the liver. The first abnormality Mann noted, when the amount of liver tissue was reduced gradually by repeated lobectomies in animals provided with an Eck fistula, was accumulation of uric acid in the blood. In his work on dogs he obtains the most satisfactory results with the uric acid tolerance test. MacLean and I have recently had some experience with the uric acid, the galactose, the bilirubin, and the bromsulphalein tolerance tests. The uric acid test usually produces no disturbance in diabetic dogs, and it appears to be as useful as any under the conditions of our experiments. There have been cases, however, in which the uric acid curve was normal, but either the disappearance of bromsulphalein or galactose was definitely retarded. The situation at present is that several of the tests should be conducted before the conclusion is reached that no abnormality is demonstrable. Glucose and fat tolerance curves may also be expected to give some idea of the condition of the liver cells, but here again, of course, the action of the liver is only one of the many factors which must be considered. A few remarks may be made about these procedures before returning to a very brief consideration of the more specific liver function tests.

GLUCOSE TOLERANCE CURVES

One is becoming more and more convinced that the procedure frequently followed in conducting glucose tolerance tests places far too little strain on the mechanisms involved. It is preferable to determine how much dextrose an animal can assimilate without exhibiting a marked hyperglycæmia or glucosuria (Woodyat) rather than merely to administer one dose of sugar intravenously and to study the rate of decrease of the blood-sugar. If the usual method is adhered to, two tests in quick succession have been reported to reveal an abnormality not apparent in the results of the first test. If the sugar is administered

by the oral route the interpretation of the results of the tests may, under certain circumstances, be further complicated by the fact that in the normal intestine of the rat and the dog, and probably in other animals, dextrose absorption apparently is practically always proceeding at a fixed rate. It might, therefore, be difficult to demonstrate an increased tolerance even if it should exist, and for the same reason considerable decrease might take place before it would be obvious. If the intestine is not normal still another variable is introduced.

FAT TOLERANCE CURVES

As far as I am aware no one has been able to obtain consistent fat tolerance curves in experimental animals. Miss Huntsman and I have tried to secure uniform results in dogs. The fat which we wished to study yielded so little lipæmia that further attempts to obtain a consistent curve after the administration of this material were abandoned. Olive oil, cream, and various other mixtures of fatty substances, of course, produce a definite lipæmia which may disappear within six to eight hours. When, however, an attempt was made to produce comparable curves in the same animal with the same amount of oil on different occasions, under apparently standard conditions, little success was secured. Fluoroscopic investigations showed us that one cause of these irregular results was variation in the rate at which the fat leaves the stomach. We resorted to a highly unphysiological procedure in an attempt to surmount this difficulty. Mann-Bollman fistulæ were created in several animals and the olive oil was introduced through these directly into the duodenum. Here again, while two curves might be comparable, the third would perhaps be grossly divergent. Since our desire was to study the effect of choline on the absorption of fat and not at that time to conduct a research on fat tolerance curves, we abandoned the attempt in the hope, which has not as yet been realised, that direct determination of the fat remaining in the intestine of small animals at various intervals after administration might yield more consistent results.

THE OTHER FUNCTION TESTS AND THE FAT AND CARBOHYDRATE RESERVES OF THE LIVER

If one is interested primarily in the effectiveness of the liver as a whole in the performance of certain duties, obviously the only method of study is to place a strain on this mechanism and to investigate the response. If one is interested, however, in the state of the carbohydrate or fat content of the liver cells, the only reliable procedure is to obtain a specimen of the liver tissue and to conduct chemical and histological studies. It is desirable to correlate the chemical with the histological findings and not to rely on either alone.

It has been reported by Harding that a diet rich in fat causes a rise in the level of blood uric acid and an increased excretion of this substance in the urine. This may be due in part to an effect on the kidney, but there is some evidence that such a diet diminishes the power of the liver to remove bromsulphalein from the circulation (Rosenthal). In the normal animal some 90 per cent. of the recommended intravenous dose of this dye is rapidly excreted in the bile. The well-established effects of diets high in fat or carbohydrate tolerance might be discussed here but the extent to which the liver is involved in this very definite change is at present unknown. While it is possible that under certain circumstances mere mechanical effects of crowding the liver cells with fat may interfere with their function in certain species, it is important to remember that in other organisms it is apparently normal to have very large percentages of fat present. Whether the very high fat content of the liver in hibernating mammals plays any part in their decreased metabolic rate may be worth considering. A slight increase in liver fat in an animal under certain conditions may be of considerable pathological significance, while a more extensive deposition under other circumstances apparently is not associated with any abnormality of liver function.

The relationship existing between the glycogen content of liver cells and their function furnishes an interesting subject for discussion. It is true that almost complete absence of glycogen is compatible (for a short time) with an increased activity of liver cells. This is seen in diabetic animals four or five days after the supply of insulin has been discontinued. The glycogen content is very low, the liver is producing large amounts of dextrose, and liver function tests may give normal results. In general, of course, conditions which exhaust liver glycogen encourage the development of fatty changes in the liver cells. I will not take time to review the experimental and clinical evidence that the presence of glycogen in the liver cells renders the organ more resistant to various deleterious influences—anæsthesia, arsenicals (or bacterial products), phloridzin, &c. It will be appreciated that glycogen deposition in the liver is only one of the effects produced by sugar infusion. It is possible that the increased amount of insulin liberated may decrease gluconeogenesis—i.e., decrease the activity of the liver cells. In other words, the presence of glycogen may be incidental.

If one is interested both in liver function and the state of the carbohydrate and fat contents of the cells, MacLean and I have found that a useful procedure to follow in dogs is to conduct the uric acid and the bromsulphalein tolerance tests and to correlate the results of these with those of chemical and histological studies made on a specimen of liver obtained at biopsy. In dogs it is preferable, as Mann has pointed out, to tie off the pedicle of a lobe and to remove the lobe completely. No tissue that is likely to become necrotic should be allowed to remain. We have used this technique frequently with success even in diabetic dogs with very fatty livers. Morphine and local anæsthesia or intravenous amytal may be used when one is primarily interested in liver carbohydrate, but nitrous oxide or ether are satisfactory, as far as is known, when only the fat content and histological appearance are under investigation. Under favourable conditions surgeons do not hesitate to remove a small piece of human liver for histological investigation, and happily chemical studies are also beginning to be made on this material.

Margin of Safety of the Liver and Restoration of Liver Tissue

These subjects are too broad to be considered in any detail at the present time, but far too important to be entirely ignored. The margin of safety which the liver possesses may be illustrated by the fact that when 80 per cent. of the liver has been removed from dogs the fasting blood-sugar is normal, although other evidence may betray the existing hepatic insufficiency. It is for this reason probably that hypoglycæmia is observed only as a terminal phenomenon in clinical cases of yellow fever and acute yellow atrophy of the liver, in which histological studies of the liver cells make an investigator marvel that the tissue can perform any function whatever.

The second important point to realise is that liver tissue apparently possesses a tremendous capacity for compensatory increase in bulk (Fishback[16]).

When one lobe is removed the others promptly enlarge. There is no regeneration from the stump of the removed lobe. It may sometimes happen that the restored liver weighs more than the original. The chief factor in restoration of the liver is the rapid multiplication of the liver cells by mitosis. New cells are also reported to be formed from the proliferating bile-ducts. An important cause of the hepatic restoration is apparently the relatively increased blood-supply, since after partial hepatectomy the same flow of blood is available for the reduced number of liver cells. Mann has found that if the blood flow to the liver is curtailed, restoration does not take place. This finding suggests that regeneration of damaged liver cells in experimental animals might be accelerated by increasing the blood flow (Markowitz). The blood flow to the liver in the unanæsthetised animal has been carefully studied by Grab, Jannsen, and Rein. The hepatic artery contributes about one-fifth of the total volume, which is approximately two-thirds of a cubic centimetre per gramme per minute. The diaphragmatic vascular connexions are responsible for only a minute amount which, as is well known, varies somewhat in different species. Occlusion of the portal vein (gradually produced) in experimental animals is without grave consequences, but obliteration of the hepatic artery above its last branch is invariably fatal within 50 hours. Hypoglycæmia is a frequent but not invariable terminal phenomenon (Collens, Shelling, and Byron [11]).

Distribution of Glycogen and Fat in the Liver

The reports in the recent literature encourage the belief that glycogen distribution in the different lobes of the liver and throughout the individual lobes is fairly even. The water content of the liver is also remarkably constant in spite of wide variations in the amounts of glycogen. During the last few years three groups of investigators have reported cyclic changes in the glycogen content of the liver of various laboratory animals (Forsgren; Agren, Wilander, and Jorpes; Higgins, Brackson, and Flock). These papers should be consulted by anyone interested in changes in glycogen and the relationship of these changes to the activity of liver cells and the flow of bile. These changes are reduced in extent in animals which have been fasted for 48 hours.

No procedure has yet been discovered by which animals may be anæsthetised without interference with liver glycogen. A great many anæsthetics have recently been studied by Evans, Tsai and Young, Young and Murphy, and Browne and Evans.[12] The factors which promote the recovery of liver glycogen which has been depleted by anæsthesia are probably the same as those which govern the deposition in the normal animal.

It is very difficult to obtain a sample of liver with a glycogen content as high as it presumably was before the procedure necessary for removal was initiated. There should be no asphyxia—which is produced to a greater degree by all volatile anæsthetics—no stimulation or inhibition of the central or autonomic nervous system which are unavoidable when barbituric acid derivations, &c., are used. Operative procedures under local anæsthesia are also accompanied by more or less nerve stimulation, but are probably the most advantageous in recovery experiments. In terminal experiments amytal may be given intravenously or intraperitoneally, and the sample of liver obtained as soon as analgesia is complete. No new comment on methods of determining the glycogen content of tissue should be necessary.

The distribution of fat in the liver appears to be quite uniform when the amount is small (Huntsman). When the infiltration with fat is moderate in amount the distribution may still be fairly uniform. When intense fatty infiltration and degeneration have taken place there may be considerable variation between different parts of the liver, and it would be highly unsafe to attach any significance to a small difference in the fat content of two lobes removed at different times. In some cases the variation in the fat content of different parts of the liver may be extreme and easily recognisable without chemical examination. When a liver has been very fatty and the fat content is then reduced by some means the rate of decrease may be more rapid in one lobe or part of a lobe than in another. This fact is probably related to the extent of the interference with blood flow produced by the degenerative changes. The lesson to be learned from these facts of course is obvious. While there is very little change in the total fatty acid content when mammalian liver tissue is allowed to stand for short intervals at room temperature, the enzymatic hydrolysis of phospholipoid and the destruction of choline are processes to be reckoned with if one is interested in these substances. The water content of liver tissue may vary considerably when fatty changes are produced.

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THE POSSIBLE RÔLE OF THE FŒTUS IN LABOUR

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In papers previously published on the Causation of the Onset of Labour, I have mentioned the principal theories which have been brought forward from time to time, and in a more recent article have suggested a theory that the causation of labour starting might be traced to the liver of the fœtus. In the many theories which have been advanced the fœtus has not received much attention, and it is remarkable that the idea of Hippocrates,[1] who considered that hunger caused the child to press on the fundus of the uterus, was accepted down to the time of Friedreich in 1831.[2] Even recently some have considered that although the factors which terminate the intra-uterine life are indefinite, they are "certainly related to the nutrimental needs of the growing child, as Hippocrates postulated."[3]

AN OXYTOCIC MATERIAL

I was tempted to endeavour to raise a fund for research into the causation of the onset of labour

on account of the difficulties I have often experienced in the induction of premature labour when this has been necessary in the interests of the mother and child. I have long held the opinion that normal labour is started by some material of an oxytocic nature which is poured into the maternal circulation; if, therefore, we could discover that material, labour would be started without the necessity and trouble of any instrumental interference. For this research work I am greatly indebted to Prof. Dodds, who has been superintending and carrying it out for some considerable time at the Courtauld Institute of Biochemistry, Middlesex Hospital. Formerly it has been apparently accepted that the ovary was concerned with labour, as well as menstruation and pregnancy, on account of the corpus luteum, and that the pituitary gland was of great importance with regard to uterine contraction. We now know that the ovaries have nothing to do with labour. In the cases of double ovariectomy I collected, one was that of a woman who had double ovariectomy six weeks after conception, followed by normal parturition. Waldstein [6] has described the case of a woman ovariectomised on the thirty-fourth day of pregnancy, followed by normal gestation, and œstrin was demonstrated in the blood and urine, as well as in the placenta at parturition. With regard to the pituitary gland, we also now know that, thanks to the work of Allan and Wiles operating in the Courtauld Institute, this gland can be removed from the cat, followed by no interference with pregnancy or parturition. Experiments on rats have been followed by similar results.[5] Halban [6] suggested that the chorionic epithelium of the placenta might exert an action similar to that of the ovaries, and that, during quiescence, the placenta might undertake, to a certain extent, its work.

Much work has been done to show by experiments on animals that the extract of the pars posterior contains some material of an oxytocic nature. It was shown by Cow [7] that rings of muscle from the vaginal end of the uterus of the guinea-pig relaxed under the influence of infundibulin, but as we presume that, considering the experiments on animals, parturition may occur without this gland, its action need not be discussed further. It is well, however, to bear in mind that as it has been suggested the chorionic epithelium of the placenta might take the place of the ovaries, so there may be some compensatory hormone of which we know nothing, and which may act as a substitute for the pituitary should this gland be necessary for the onset of labour.

INNERVATION OF THE UTERUS

Before passing to the fœtus, it must be mentioned that the innervation of the uterus itself is remarkable, and that the uterine muscle contains an enormous number of sympathetic ganglia and nerve trunks, as demonstrated by Keiffer [8] of Brussels. There is reason to believe that impulses conveyed through the sympathetic nerves produce contraction of the circulation and inhibition of the longitudinal muscle-fibres of the uterus.[9] No other muscle of the same thickness contains in proportion anything like the rich nerve-supply except the heart. This innervation proves how rapidly anything exciting these ganglia, either in the blood or by emotional stimuli through the sympathetic system, causes contraction of uterine tissue. As my belief is that the normal cause of the onset is some hormone in the blood which excites the ganglia of the uterus, thus causing contraction, it is unnecessary to enter into any details regarding the various theories which have been advanced for the cause of labour starting, such as the pressure of the fœtal head on the lower part of the uterus, distension of the uterus, degeneration of the amniotic membrane, placental infarcts, &c. But of course, apart from normal conditions, many substances circulating in the blood may excite the uterine ganglia.

BLOOD CHANGES AND LABOUR

A very common example of changes in the blood inducing labour may be seen in cases of sudden obstruction in the larynx, causing the blood to be charged with carbonic acid. I well remember a patient more than 7 months advanced in pregnancy, who was seized with laryngeal obstruction necessitating tracheotomy, which was successfully performed, but the intense cyanosis, which rapidly affected the whole body, induced labour, the child being stillborn. Brown-Séquard,[10] from experiments on animals, proved that overloading the blood with carbonic acid brought on labour, and he was supported in this theory by Leopold [11]; Runge, however, considered that it was due, not to overloading with carbonic dioxide, but to the diminished oxygen content of the blood, which brought on uterine contraction.[12] It is quite common now to bring on labour at term with quinine, which shows that changes in the blood circulating through the uterus stimulate the ganglia and cause contraction.

In the numerous experiments which have been carried out by Fontes,[13] Brdiczka,[14] and others, it is clearly proved that there is some material of an oxytocic nature in the blood of the mother at the time of labour. Fontes (1829–30) considered that stimulants acting on the uterus during a special state caused the contractions of labour, and that, therefore, we should find in the blood of the mother an oxytocic substance of sufficient strength to finish labour. His experiments on immersing the uterine cornua of guinea-pigs in the blood of a man and the defibrinated blood of a woman in labour respectively, are well known as showing rhythmical contractions for many hours in the latter, and feeble contractions or rest in the former. Brdiczka found that the blood from parturient women during and towards the end of pregnancy, and placental fluid, produced strong contractions in the uterus of a guinea-pig when added to the uterine bath, but serum from normal women, or in commencing pregnancy, caused very few or no contractions. He believed that the placenta was the origin of the oxytocic substance. These and similar experiments are of importance as supporting the theory of some irritating material being present in the blood before labour.

ŒSTRIN

With reference to œstrin, much has been written about it. Many believe that the placenta acts as a reservoir for storing it. It is important to bear in mind that the ovaries are not necessary for its manufacture, as pregnancy, after starting, may continue without them. It has been shown by Zondek [15] that the implanting of placenta in a mouse before puberty produces sexual maturity, as well as causing ovulation and the formation of corpora lutea in the ovaries. Collip [16] from his experiments believed that there is an ovary-stimulating hormone of the placenta which is not œstrin, and to which the name Emménine has been given, but space forbids further reference to this. If œstrin were the material which would start labour there is abundance of it, but up to the present I do not know of any reliable evidence of its value

when injected into pregnant women. It may be of interest to note that in the case mentioned by Waldstein he found that œstrin was diminished in the blood and urine, as well as in the placenta, at parturition. Large doses injected into animals will bring on abortion, as shown by Parkes.[17] If injected with Pitocin abortion came on in from 1 to 6 hours, but with œstrin not until 36 to 48 hours after injection.

It is interesting to note that a fresh set of corpora lutea can be added to the ovaries as desired, and in the rabbit ovulation can be induced at any stage of pregnancy by a single injection of extract of anterior lobe or the urine of a pregnant woman. These experiments were undertaken by Franklin S. Snyder [18] in an attempt to determine the rôle of the corpora lutea in parturition. Although the ovaries may be absent it may show that certain hormones injected into the circulation may influence uterine contraction.

UTERINE EXCITATION

Reviewing all that has been done with regard to these experiments, there seems to be strong evidence in favour of some hormone of an oxytocic nature being the cause of the uterine excitation starting labour. The source of this hormone has yet to be discovered. Although animal experiments suggest a synergistic action between œstrin and pituitrin, it is well known that the isolated uterus bathed with œstrin is more sensitive to pituitrin as shown by the increased contraction, but there is no evidence that œstrin is the cause of uterine contraction in labour. It was shown by Dodds that enormous doses of œstrin would be necessary to have any important effect in starting labour. The theory that in early pregnancy œstrin is held in check by the luteinising factor in the ovary, placenta, and anterior hypophysis, and that the inhibiting action is released with the maturity of pregnancy cannot be accepted, for we know that pregnancy can go to term without either the ovary or the pituitary, unless it is presumed that some other secretion, as suggested by Halban, might exert action similar to the ovaries. Thornwell Witherspoon [19] administered ovarian follicular fluid in the form of theelin in various doses to ten pregnant women at term, and labour occurred within 36 hours in two cases only. The same hormone in the form of amniotin or progynon was given alone or in combination with pituitrin or pitocin in various doses and at different times to 30 women at term, and only seven were delivered in 36 hours. To test whether there might not be an oxytocic factor present in the blood of parturient women, 25 c.cm. of blood taken from women in hard labour were injected into three women at term; one was delivered in 11 hours. In the case of 45 full-term women in only 22·2 per cent. labour was apparently induced by hormonal injections. The fact that labour started so quickly after the injection of blood from a woman in labour is interesting, for it must approach the normal oxytocic material, but it must be remembered that hormonal injections are not the only ones which will produce oxytocic material in the blood. What we have to discover is something sufficiently powerful to excite the uterine ganglia to produce contractions. Œstrin is certainly of no use, and it is obvious that enormous doses would be required, considering that there is already a large amount of this material circulating in the blood at term. Blau and Hancher [20] proved that the intravenous injections of various extracts besides that of the ovary (spleen, liver, testes, &c.) also produced oxytocic substances in the cerebro-spinal fluid. Notwithstanding all the time and labour bestowed on experiments with a view to discovering from a maternal source the constitution of the material in the blood which acts on the uterine ganglia, nothing has been definitely established. And here it may be remarked that these experiments have been carried out with a view to determining the presence of some oxytocic material in the blood-serum, renal secretion, and cerebro-spinal fluid, as well as the chemical, physical, and spectroscopic investigation of the blood of parturient women.[21]

THE FŒTUS

Turning to the fœtus, we know that the blood, as it comes from the umbilical cord, is entirely different from that of the maternal circulation. This must be accounted for by secretions from internal glands being poured into it during its passage. The blood in the umbilical vein passes directly to the under-surface of the liver, where divisions go to the left lobe and to the lobus quadratus and lobus spigelli. Therefore the first changes must take place in the liver, which may contain many hormones. We do not yet know enough about the secretions of the fœtal internal secretory glands, and investigation is obviously extremely difficult. The thyroid has a colloid-like secretion at four and a half months.[22] The suprarenals contain adrenaline at 16 months, and the pituitary gland shows an active principle at eight months. Therefore all these glands are acting at maturity. It is certainly remarkable that the fœtus should have such a large liver,[23] weighing one-eighteenth part of the total body-weight of the fœtus. The blood of the fœtus differs materially from that of the mother; there is an excess of non-volatile acid compounds—an acidosis of birth.[24]

After consulting many authorities, Karnitski [25] in his review states that the iron and hæmoglobin contents are greater in the fœtal than in the maternal blood, and that nucleon or phospho-carnic acid is found twice as great in amount in the fœtal blood as in that of the placenta. Joseph [26] has assayed the urine of new-born infants and reported certain factors, and that no hormone was present after the fifth day. When a child is born, the intense contractions of the uterus cease. From a series of experiments, it has been shown that the blood taken from the umbilical cord immediately upon birth contains substances which promote the activity of the uterus in a guinea-pig to a greater extent than other blood, or that of the mother.[27] There is very little theelin in extracts of embryo, although it has been demonstrated in the umbilical cords of human fœtuses at term.[28]

CONCLUSION

In conclusion, I may say that notwithstanding numerous experiments carried out during this research on the blood, tissues, secretions, &c., of parturient women, they have failed, as already mentioned, to yield convincing results.

With regard to the fœtus, Dodds says: "A very careful study of the tissues of the fœtus has been made in the attempt to trace substances capable of initiating the changes associated with labour. Up to the present these have not met with success, but it is felt that continued careful study of such extracts may open up a new line of approach."

In my own opinion there is a possibility that in the future more delicate biochemical tests may be forthcoming which will throw new light upon this research, and enable us to prove definitely the actual constituents of maternal and fœtal blood. Much time and labour have hitherto been devoted

to the pregnant and parturient woman. In future, more attention will be paid to the fœtus. I am glad to say that a fresh set of experiments is about to be undertaken, the results of which will be published later, for this research will continue. If success should be achieved it need hardly be said that it will be a lasting benefit to countless generations to come.

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CHANGES IN THE CENTRAL NERVOUS SYSTEM DUE TO ELECTROCUTION

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THE pathological changes that are found in the brains of persons dead from electric shock, whether by lightning stroke or by accidental contact with high-tension conductors, fall into two main groups.

There are those changes that result from any form of severe mechanical damage of the skull and of its contents, and those changes that are found only in fatal cases of electrocution. The former group can in many cases be accounted for by a fall or a blow received at the time of the accident, and no other explanation of their occurrence is necessary. The latter group of changes are peculiar to this (electrical) form of damage and their explanation is therefore to be sought in some property of this particular variety of injury—i.e., in terms of some property of electrical discharges.

These lesions of the central nervous system which are peculiar to the brains of fatally electrocuted persons are as follows:—

(1) The cerebro-spinal spaces are dilated; in the main subarachnoid spaces there is wide separation of the pia from the arachnoid and the perivascular spaces are often greatly distended.

(2) There are abnormal holes or spaces in the brain due both to rents or fissures in its substance and to the local separation, by splitting apart, of adjacent cortical layers.

(3) The ganglion cells are damaged with unequal severity in different groups, but in a way which points in many cases to their disruption in a peculiarly sudden and violent manner.

(4) The blood-vessels are severely and extensively damaged, especially the larger ones at the base of the brain; their muscular coat suffers most and is sometimes completely ruptured.

These lesions have been found after every precaution has been taken to avoid similar distortion of the tissues due to faulty fixation and staining methods. Their occurrence has always hitherto been explained in one of three ways—i.e., as being due either to the heating effect, to the electrolytic effect, or to the mechanical effect of an electric current.

HEATING EFFECT OF THE CURRENT

In a large number of cases of fatal electrocution it is certain that the current passing through or over the body is sufficient to produce somewhere in its path enough heat to account for severe damage to the tissues.

Thus, if we consider the case of legal electrocution as carried out in America—in which 2300 and 550 volts are applied in succession for 7- and for 52-second periods respectively, and each repeated once [1]—since we know the resistance of the body to be about 200 ohms in these circumstances [2] we can estimate that the heat liberated during this electrocution must be

$$\left[\left(\frac{2300}{200}\right)^2 \times 200 \times 14 + \left(\frac{550}{200}\right)^2 \times 200 \times 104\right] \times 0{\cdot}239 \text{ calories.}$$

This will be sufficient to raise the temperature of the whole body of a man of 10 st. through

$$\frac{0{\cdot}239 \times 200 \times (12^2 \times 14 + 8 \times 104)}{140 + 454} \text{ degrees centigrade}$$

or 3½ degrees Fahrenheit.

Since the conductivity of the cerebro-spinal fluid is about 150×10^{-4} (Eckel [3]), of the blood is about 120×10^{-4} (Strohl [4]), and of the other tissues of the body so much less than either of these, it is probable, as Langworthy and Kouwenhoven have stated,[5] that most of the current goes through the blood-vessels—but also much through the cerebro-spinal fluid which, although less in volume and more confined in extent, has the lower resistance. If we take the total cerebro-spinal fluid volume to be about 150 c.cm. and the total blood volume to be about 4 litres, and assume that the specific gravity and the specific heat of both these fluids is about unity, then we see that the above amount of heat—if confined to these tissues in which the current mainly passes—will be sufficient to raise their temperature through

$$\frac{0{\cdot}239 \times 200 \times 2848}{4150} \text{ C.°—i.e., through 60° F.}$$

Now we know that in cases of legal electrocution temperatures of 145° F. have been measured in the cerebro-spinal fluid several hours after death [6]—i.e., a rise of presumably about 145–98° or 47° F. Therefore this rise in temperature can be well accounted for by the quantity and form of electricity used: it is sufficient most seriously to damage the central nervous system, but, as will be seen later, it is not capable of producing the lesions here in question.

When we attempt a similar calculation in cases of lightning stroke we are reduced to defining the probable upper limits of heating, since we have no

precise data such as are available in the case of legal electrocution.

The total electrical energy in most lightning flashes varies from 5 to 50 coulombs [9] and 20 coulombs may be taken as a reasonable average.[10] If this quantity of electricity were passed entirely through the body, then, since the average head-to-foot resistance of this, in the absence of special electrodes and with a normal condition of the skin, is about 5750 ohms,[6] the heat evolved will be not more than

$$20^2 \times 5750 \times 0{\cdot}239 \text{ calories.}$$

This will be sufficient to raise the temperature of the whole of the body of a man of 10 st. through

$$\frac{20^2 \times 5750 \times 0{\cdot}239 \times 9}{140 \times 454 \times 5} \text{ F.°—i.e., through 14° F.}$$

The actual rise of temperature along the path of the current is much higher than this—as is shown by the linear burning of the skin. It is to be presumed that the amount of the total current which passes actually through, and not along the surface of, the body produces heating locally in its path, and the same considerations that were discussed above in relation to legal electrocution will hold here also. But as we have in this case no idea whatever of the amount of current passing through the body we cannot again in the same way estimate the probable amount of heating of the blood and cerebro-spinal fluid.

Yet even if we assumed that in the case of lightning stroke also there was a great local rise of temperature within the blood and cerebro-spinal fluid spaces—in neither of these cases could the observed lesions be explained in this way.

The coefficient of expansion by heat of the tissues of the body is relatively small. Liquids expand more than do solids, yet if we assumed that all the cerebro-spinal fluid in the nervous system were raised to boiling point its total volume of, say, 150 c.cm. would be increased between 37° and 100° C. only to $150 \times 1{\cdot}0042$—i.e., to 150·6 c.cm.—a total increase of volume of about 0·5 c.cm. This certainly cannot cause any wide dilatation of the subarachnoid spaces, and the only possible way in which heat expansion alone can give rise to these changes is by actually boiling the blood and the cerebro-spinal fluid so that steam is given off under pressure sufficient to distend the tissues.

It is unlikely for two reasons that this does in fact take place. In the first place, the lesions in question are found in nearly all cases of fatal electrocution whether by lightning or by high-tension conductors and yet survivors from these accidents rarely have any permanent damage of their nervous system, so that it is most improbable that the degree of heating indicated above is ever approached. In the second place, the amount of heat available in some cases in which these lesions are found is not sufficient for this purpose.

Thus in the case of legal electrocution the 1200 coulombs of heat available is sufficient to raise the blood and cerebro-spinal fluid through about 30° C., as has been shown above; it is not sufficient to raise it anywhere near to boiling point which would require 4150–63, or about 260,000 coulombs. Moreover the blood remains fluid and therefore cannot have been heated anywhere near to boiling point.

Therefore heating alone cannot account for the lesions observed and cannot make any serious contribution—by producing local expansion of the tissues—to their formation, although by causing coagulation of the tissues around the blood-vessels it may alter them in a way which leads to subsequent shrinkage during fixation.

ELECTROLYTIC EFFECT OF THE CURRENT

It has been suggested by Spitzka and Radasch [7] and quoted by others [4] that the dilated spaces and tears in the nervous system may be produced by the expansion of gases liberated by electrolysis from the tissue fluids. When a current is passed continuously in one direction through a conducting fluid which is an electrolyte, gases may be liberated at the places of entry and of exit of the current; they will not be liberated at intermediate places in the fluid.

Thus, in the first place the production of these changes in the nervous system by an *alternating* current is not accounted for, and in the second place no multiple, local, gaseous collections will occur. If the physical quantities involved are taken into account, this explanation is seen to be still less adequate, even for any case to which it might be otherwise applicable.

Since the electrochemical equivalent of oxygen is 0·00008293—i.e., this weight of oxygen is liberated by 1 coulomb of electricity—it follows that the whole of the electric energy in an average lightning flash of 20 coulombs [9] will produce only $8293 \times 20 \times 10^{-8}$ grammes of oxygen which will occupy at the normal body temperature

$$\frac{22{\cdot}4 \times 8293 \times 20 \times 10^{-8} \times 310}{32 \times 273} \text{ litres or about 1 c.cm.}$$

At the same time 2 c.cm. of hydrogen will be liberated so that the whole of the lightning flash if it all passed entirely through the electrolytes of the body would produce only 3 c.cm. of gas, an amount which cannot make any serious contribution to the production of the lesions in question.

MECHANICAL EFFECT OF THE CURRENT

Hassin [1] has examined the explanations given in terms of heating and of electrolysis and has rejected them on purely circumstantial grounds—i.e., on the absence of similar changes in cases of fatal hyperthermia and of caisson disease.[1] He considers that the changes are "due to purely mechanical factors. The action of a strong electric current is equivalent to direct mechanical injury . . . a momentary violent jarring . . . the mechanical factor—the jarring—is the electric current." [1]

That Hassin is right in his opinion that heating and electrolytic effects alone cannot account for these lesions follows from the calculations that have here just been made, but the meaningless expressions quoted above do not provide any reasonable alternative: to state that "the mechanical factor . . *is* the electric current" (see above) has no meaning; in fact, the mechanical factor is not even *due to* the *current*. The only mechanical effects that attend the presence of neighbouring electric currents are due to the electromagnetic forces; these are entirely negligible in the case of currents passing through the body and, such as they are, they will tend to produce contraction and approximation of the conductors along which they pass and not dilatation.

From the above it follows that none of the effects of a current passing through the body can account for the peculiar disruptive lesions in the central nervous system and an alternative explanation is needed.

It should be noted that explanations have hitherto been advanced only in terms of the electric *current* set up by the passage of a quantity of electricity through the body. No attention has been paid to the forces due to the presence of this electric *charge* upon the body. These will now be considered.

ELECTROSTATIC EFFECTS OF LIGHTNING AND HIGH-TENSION SHOCKS

It is in no case simple to decide what is the electrical state of affairs present when a man is electrocuted either by lightning stroke or by coming accidentally into contact with a conductor at high potential. The path of the current through the body can only be guessed at from a knowledge of the physical factors involved, and our knowledge even of the quantity and of the form of the electric energy supplied is in most cases uncertain. In the case of legal electrocution we know most about these factors, for we know the effective voltage, the resistance of the body, and the duration of the current. In the case of lightning stroke we know least—even the accepted physical views of just what is happening in the occurrence of a lightning flash have been profoundly modified [10 11] twice in the last five years.

An uncharged conducting body which is brought into electrical contact with a charged conductor becomes itself charged and will remain at the same potential as the originally charged conductor so long as the contact is maintained. If now the conducting body which has been charged in this way be removed from the originally charged conductor and come into contact with yet another conductor at a lower potential it will share its acquired charge with the latter—e.g., if it be earthed, the acquired charge will all run to earth and the final potential will be that of the earth. But should this happen while contact with the originally charged conductor is maintained the conducting body which received the charge will continue to do so, and a current will flow through it to the earth.

Thus if a man make effective contact with a conductor at high potential or if he be struck by lightning he will become suddenly highly charged with electricity, but a current will pass through him only if he is in a position to lose this charge in some way. The surrounding air will take away a little gradually,[10] most rapidly from angles and promontories of his person, but without setting up any current within him. If, however, he is making effective contact with the ground or with some conductor at low potential at the moment of the accident then the rate at which the charge passes through or over him will depend upon how good this contact is. If it is good, then the charge will pass away from him as rapidly as it is received, the current through or over him will be large and no charge will accumulate upon him. If it is poor, then the current will be smaller and the average charge maintained upon him will be proportionately greater. As a result of the current passing through him the heating, electrolytic, and mechanical effects discussed above may be anticipated. As the result of the charge upon him his body will become subject to certain forces which will be discussed in detail later and which are known as the electrostatic forces.

In the case of lightning stroke this distribution of current and of electrostatic effects will depend upon the degree of insulation of the man from the earth. If he makes good contact with wet ground through damp boots, then the current will be great and the effects of the static charge slight. If he makes poor contact with dry ground through boots that are thick and free from many nails, then more charge will accumulate upon him and for a longer period, and the electrostatic forces will be strong. That these differences in the effect according to differences in contact with the ground are not merely a matter of theoretical conjecture, but also of observed happenings, is to be seen from the eye-witness accounts that Spencer has recently published from his own personal observations.[12] He has pointed out that persons standing on wet soil when struck by lightning may fall to the ground in pain from powerful contraction of their muscles and yet have no memory of having received any blow and have no bursting apart of their clothing.

Langworthy and Kouwenhoven have shown that when a strong current is passed through the body of an animal the whole musculature becomes violently contracted, usually in tetany with an alternating current and in clonic jerkings with a direct current.[2] Another account of Spencer's illustrates the opposite effect: in circumstances of poor conduction to the ground inside a dry shelter the charge may accumulate upon the body with sufficient tension to escape from a flexed elbow on to another person standing nearby who is killed by receiving it.[12]

The electrostatic forces upon a charged body are derived from the mechanical repulsion which is exerted between all similarly charged particles or bodies. In the first place a charged body will be repelled from all similarly charged bodies with a force that depends only upon the amount of these charges and the distance between them. In the second place all those separate, constituent parts of the body which carry the charge will be repelled from one another.

Let us examine first the part that these forces may be expected to play in bringing about the effects of electrocution upon the body as a whole, and later the contribution that they may be expected to make to the production of the lesions inside the body.

The immediate effects, as seen by bystanders, of coming into contact with a conductor at high potential or of lightning stroke vary in different circumstances. In many cases, in which a man actually grasps a high-voltage conductor, he is sufficiently well earthed for the current through him to be initially strong, and the tetanic contraction of his arm muscles produced by this current causes him to remain clasping the charged object. In other cases widespread spasm of his whole musculature jerks him in some direction which may be either away from or towards the source of the shock. In some cases, in which two men standing near together are holding a conductor that suddenly becomes highly charged, they may be flung violently several yards apart—an instance of this repulsion is cited by Pearl.[13]

The immediate effects of lightning stroke are fairly well known: the following analysis of these effects is based upon the detailed accounts that have recently been given by Spencer of many such accidents that he has personally observed.

From these accounts we learn that when a man is struck by lightning he falls or is flung to the ground. He may afterwards remember having felt as though he received a stunning blow to the head. He is found to have a circumscribed effusion into the scalp over the top of his head. His skin is burnt both with characteristic linear brush-burns, over which the clothing is completely burst through, and also more severely beneath any metallic object carried about the person. These results are found in most cases of lightning stroke and are independent of the circumstances in which the man may be placed at the moment, but the circumstances provide other additional results of a similar nature.

Thus anything that the person struck may be holding is flung away; a bundle carried is burst open and its contents scattered[13] (p. 34); a

baby held in its mother's arms is flung violently away with sufficient force to knock over another person sitting a few yards off (p. 41).

If the person struck is standing on or walking over open, flat country he falls directly to the ground (p. 43). If he is standing near to other objects that also are struck he will be flung away from them; when a group of men are struck while standing close together they are flung apart in different directions (p. 38); when a man is struck while standing close to some rigidly fixed conductor such as a tree or a tent pole (p. 72) he is flung directly away from this.

These effects have been explained in many different ways. The tetanic contraction of the muscles can account for the sudden "crumpling-up" of the man and his fall to the ground; it certainly could not jerk him through 9 or 12 yards or cause the other "repulsion" effects above described.

All these violent mechanical effects were originally ascribed haphazard and uncritically to "electricity." Recognising the need for some more scientific explanation, Sir Oliver Lodge ascribed them to violent commotion of the air around the path of the lightning flash, due to highly compressed air pushed before the current. As an alternative, others have suggested that the sudden air commotion may be due to heating and expansion. Examination of the actual happenings in cases of lightning stroke shows that neither of these explanations is valid. It has been pointed out that there is nearly always an effusion beneath the scalp of the person struck; this suggests that a heavy blow has been received but it can in fact always be distinguished from the effects of such a blow by the complete absence of superficial abrasions (ibid., p. 31). Violent commotion of the air sufficient to fling a man 12 yards away would certainly displace other movable objects in the immediate neighbourhood, but it is found that only persons and objects which actually share in the discharge are displaced in this way. There are many examples in Spencer's book of a full lightning flash passing to earth without displacing an object standing a few feet away when this object does not become charged (p. 72), and others which show that so little commotion of the air itself may occur that sleepers in a tent, down the pole of which the lightning strikes, may sleep on undisturbed (p. 83).

It is doubtful if expansion of the air by heating can, as is popularly supposed, account for the stripping off of the clothing. Although the clothes are burnt through with the heat this is only along linear burns, and since the air is a very poor conductor of heat this intense local heating will not have much effect in expanding any but the immediately adjacent air; the skin elsewhere on the body is conspicuously free from signs of heating and yet the clothes may be completely stripped off, leather belts and boots burst and discarded in a way that suggests that they have been repelled from the body in all directions.

The sudden violent displacement from one another only of those persons or objects that are struck must be due to the appearance of mutually repulsive forces between them that depend upon the reception of the electric charge. These forces may, in quite ordinary circumstances, be very great.

Thus we may examine the conditions when a man is standing in the shelter of a tree when both are struck by lightning. If we assume that the total discharge is 20 coulombs [9] and that only one-hundredth part of this reaches the man, the rest passing to the tree, that the man is standing 3 metres away from the tree and that only one-tenth of the charge on the tree is effective as being near enough to the man, then we find that he will be repelled from the tree with a force of

$$\frac{\frac{1}{100}k \times \frac{99}{1000}k}{300^2} \text{ dynes, where } k = 20 \text{ coulombs} = 20 \times 3 \times 10^9 \text{ electrostatic units}$$

this is a force of

$$\frac{400 \times 9 \times 10^{18}}{9 \times 10^7} \text{ or } 4 \times 10^{13} \text{ dynes.}$$

This force acting upon a man of 10 st., as an impulse, will give him a velocity "V" away from the tree where "V" is given by

$$\tfrac{1}{2} \times 140 \times 452 \times V^2 = 4 \times 10^{13}$$

$$\text{or } V^2 = \frac{8 \times 10^{13}}{140 \times 454} = 1{\cdot}2 \times 10^9$$

$$\text{i.e., } V = 3{\cdot}5 \times 10^4 \text{ cm. per second or } 35 \text{ metres per second.}$$

If the man is standing erect when he is flung away with this velocity, and if he is 5 ft. 9 in. tall so that his centre of gravity is about 3 ft. from the ground, he will take a time "T" in falling freely to the ground where "T" is given by

$$3 = \tfrac{1}{2} \times 32 \times T^2, \text{ i.e., } T^2 = \frac{6}{32},$$

then he will be flung on to the ground a distance "D" away from where he was standing, where "D" is given by

$$D = 35 \times T \text{ metres.}$$
$$= 14 \text{ metres, or } 17 \text{ yards.}$$

The chief assumptions used in making this estimation were that the man receives one-hundredth part of the discharge, and that one-tenth of the remainder on the tree is on a part that is near enough to be effective. Both of these assumptions are within reason, and the displacement of a man in these circumstances through 9 to 12 yards by these forces can be reasonably explained.

SURFACE CHARGE IN LIGHTNING STROKE

These forces of mutual repulsion between neighbouring objects will affect the central nervous system only in so far as they may damage the body by flinging it to the ground—i.e., in the same way as would any heavy fall. It is the second set of electrostatic forces that are capable of producing specific changes inside the body.

When a conductor becomes charged by a static electric charge, this charge is all concentrated upon its surface; directly contact is made in some one place between this body and another such as the earth, this charge will all run to earth along the surface or through the body of the conductor by whatever paths offer the best conductivity. So long as any charge remains upon the surface of the body it will produce a force acting outwards upon that surface, because each element of the surface is repelled from all other elements and the total effect is that the whole surface tends to expand away from the body in all directions. If the body itself is easily distensible it will expand—e.g., a soap-bubble when charged increases visibly in size. If the body is more rigid and its parts have strong cohesion no such visible expansion will occur, but the tendency to dilate will be exactly the same; the distending or expanding forces on the surface will have the same effect as a

proportionate sudden reduction in the atmospheric pressure acting upon the body.

In the case of a man of average size who receives—to make the same assumption as previously—only one-hundredth part of an average lightning discharge, the force acting outwards all over him will be

$$2\pi\left(\frac{\Sigma}{A}\right)^2$$ Σ being the total charge, and A being the total surface area

this is

$$2\pi \times \frac{3 \times 10^9}{5 \times 1{\cdot}7 \times 10^4} \text{ dynes—i.e., } 73 \times 10^8 \text{ dynes}$$

this is

$$\frac{73 \times 10^8}{1{\cdot}5 \times 10^4} \text{ dynes/cm.}^2$$

or about half an atmosphere pressure

so that the effect of this charge will be equivalent to a sudden reduction of the atmospheric pressure to half its value.

This sudden expansile force will be communicated to all the tissues within the body, passing inwards as a wave of decompression, and these tissues will yield in proportion to their rigidity and cohesion, the distortion of all spaces within soft structures and the separation of parts having little cohesion is to be expected.

DISTRIBUTION OF THE LESIONS IN THE NERVOUS SYSTEM

The characteristic histological changes within the nervous system have been summed up by Spitzka and Radasch [7] as indicating that the tissues have been subjected to "some diffusely explosive or disruptive force." Langworthy and Kouwenhoven have described the changes in the cells of the nervous system of electrocuted animals as giving the appearance of "explosive suddenness," "almost as if the cell had been blown to pieces by dynamite." [2] The histological changes that follow a severe blow to the head do not include the peculiar changes that are here described. The localised gaps and tears and widening of perivascular spaces are due either to disruptive forces originating locally, or to the sudden local yielding of the tissues in many places to some general expansile force.

It is difficult in any given case to say what particular combination of the electrothermal, the electrolytic, and the electrostatic effects is responsible for a given lesion in the brain. It is more easy to explain why the lesions which are in fact found, are present in the particular situations in which they do occur.

It has been seen that the electrostatic effects will produce the greatest changes in the nervous system in those places where rigidity is smallest and cohesion least. This suggests that their maximal effect will be upon the fluid spaces rather than upon the brain substance and, in respect of the fluid spaces, greater in the subarachnoid space and its smaller ramifications which do not possess special sheaths than in the blood spaces, which are surrounded by elastic and muscular walls.

The heating and the possible electrolytic effects will be greatest both outside and inside the body where the electrical conductivity is highest. Outside the body this is along creases in the skin where sweat has collected [12] and over metallic objects to which the charge has been attracted. In the central nervous system as a whole, electrical conductivity is best in the cerebro-spinal fluid,[3] not quite so good in the blood,[4] and very much smaller in the brain substance.[5] The current effects of heating should therefore be greatest in the cerebro-spinal fluid spaces and next in the blood-vessels. In respect of current passing through the substance of the brain itself, it is interesting to note that from their electrical experiments on animals Langworthy and Kouwenhoven have found that the Purkinjé cells suffer an exceptionally severe amount of damage,[2] while Hassin has found that the tearing apart of adjacent cortical layers in man is particularly conspicuous between the damaged Purkinjé cell layer and the granular layer in the cerebellum.[1]

The proportion in which the causation of these lesions in the central nervous system peculiar to fatal electrocution is to be ascribed to *current* and to *electrostatic* effects can only be decided when we have a more accurate idea of the electrical state of affairs within the body than we have at present. The observed distribution of these lesions seems to correspond closely with what is to be expected from a theoretical consideration of the known possibilities.

SUMMARY

Reasons have been given for believing that the heating and electrolytic effects of high-tension currents cannot be held responsible for the production of those lesions in the central nervous system which are peculiar to fatal electrocution and to lightning stroke. The contribution of electrostatic forces to the production of these lesions is discussed.

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TREATMENT WITH THE CARBON DIOXIDE SNOW PENCIL

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THE chief difference between the destructive action of the hot cautery or the cold cautery (diathermy) and CO_2 treatment may be summarised in two words: vital reaction. You cannot destroy a tumour or a vascular nævus on a cadaver by freezing it, although obviously you can burn it away. Vital reactions are never immediate to the naked eye. Even the weal of the stinging nettle or the whip lash takes an appreciable time to develop; it is also a vital reaction and cannot be produced after death. These points are fundamental, and important if the mechanism of CO_2 treatment is to be understood. The effects are the result of damage to the delicate endothelial walls of blood-vessels, the consequent exudation of serum (causing a bulla to develop locally), and ultimately a reduction of the blood-supply to the area frozen. This leads to local necrosis

to an extent depending on two factors: (1) the length of time during which the pencil was in contact with the tissue; and (2) the pressure with which it was applied, and the counter-pressure of firm underlying tissue. More pressure can be used on bone, for example, than on the eyeball behind the eyelids, from which no counter-pressure can be easily elicited.

It seems to follow that the more vascular a tumour the more vulnerable it should be to the effects of freezing. Within limits this is true, but it must be remembered that blood—free blood as in a large cavernous angioma—is a bad conductor of heat (and, therefore, of cold); and that it is by no means always possible to empty the tumour of its blood before it is frozen. Moreover, a cavernous angioma is deficient in normal endothelium, and in the sympathetic connexions that are responsible for the vital reactions producing exudation and subsequent necrosis. Fibrous tissue contains relatively little vascular tissue, and it is doubtless for that reason that freezing will have little effect on a fibroma or lipoma or even on a wart unless the pencil overlaps the tumour and is able to provoke a reaction in the normal tissue in the vicinity. With cellular structures, especially if they are soft in consistence, the position is different, for these, if they contain a moderately good blood-supply, will respond to application of the pencil.

If these principles are correct, it follows that the acetone snow mixture recommended by some authors is less efficient than the pencil, for the factor of pressure is lacking, and moreover the temperature of such a mixture depends largely on atmospheric conditions and the relative amounts of snow and solvent used. It is, in fact, far less efficient, and I do not recommend it for dermatological purposes.

The vital reaction may be the chief reason for the extreme rareness of septic complications after freezing, and probably also explains the relative perfection of the resulting cicatrices, which are never hypertrophic or keloidal. Secondary contraction and resulting deformity or interference with function (of an eyelid, for example) are equally rare, and afford additional reasons for the use of this, one of our least dangerous and most efficient therapeutic weapons.

The number of conditions, both dermatological and other, that can be treated by CO_2 is very great, and a glance at the list submitted by Lortat-Jacob and G. Solente in their excellent text-book [1] suggests that there is scarcely a dermatological condition which at some stage in its evolution is not amenable to cryotherapy. The list includes acne vulgaris and rosacea, keloid, angioma, angiolupoid, aphthæ, and so on, right through the alphabet to xanthelasma and xeroderma pigmentosum. Among non-cutaneous affections, trachoma and chronic cervicitis are cited as being favourably influenced. With a little practice, and keeping in mind the dictum that it is always easy to repeat a treatment but not so easy to remove the effects of an overdose, the practitioner runs no risk of doing harm to any chronic and circumscribed condition which in his opinion would be benefited by the reaction consequent on freezing, whether he aims at producing a mild serous exudation only or a destructive or necrotic effect.*

[1] La Cryothérapie, Paris, 1930.

* As regards apparatus, a large cylinder (and spare) is an essential for hospital requirements, but for private and occasional use there is a good little pocket apparatus put up by the Sparklet Co. The dwarf cylinders are large enough to provide enough snow for the average case, and the cost of renewals is very small.

TREATMENT OF STRAWBERRY NÆVI

As an illustration of the value and use of the method, I propose to describe its application to the condition most commonly calling for such treatment—namely, the raised, localised strawberry nævus, or angioma circumscriptum.

The patient is usually an infant, and there is no contra-indication to the application of the pencil provided the child is in normal health and not suffering from an infective skin condition. The snow is pressed into a circular receptacle or mould slightly larger than the nævus to be treated, and is then expelled by means of the piston which hammered it into shape, and wrapped in cotton-wool in such a way that about a quarter of an inch protrudes beyond the wrapping. The patient is firmly held, preferably by a nurse, and the pencil applied with a pressure of about 1 lb. weight for 10 to 15 seconds, depending on the approximate thickness of the nævus. Great care should be taken to see that overlapping is complete and, as far as possible, equidistant around the circumference. The tissues turn white and are depressed below the surface for about the same time or a little longer than was required to freeze them. Thawing soon takes place and the circulation returns. This stage is the most painful of the whole procedure, but lasts no longer than about three minutes.

Depression of the frozen surface gives place to slight elevation, and very soon a ring of exudation, considerably wider than the frozen area, makes its appearance. This may or may not progress to the formation of a bulla, which should not be immediately pricked, as it will almost certainly refill with serum. If still present some five or six hours after the operation, the fluid may be let out with a sterile needle and the small reacting area liberally sprinkled with boracic and starch powder, or calamine lotion containing a little spirit. Ointments should not be applied at this stage at all, and the greatest care should be taken to preserve the roof of the bulla, which eventually forms a firm crust and is nature's own dressing. It must not be removed under any pretext, or an indolent rapidly crusting and slightly ulcerated area will be left and the eventual scar may be unsightly or hypertrophic. The crust separates spontaneously in about ten days as a rule, and it will then be apparent to what extent the vascular tissue of the nævus has been destroyed. Residual hyperæmia must not be mistakenly regarded as angiomatous, and in any case the immediate temptation to repeat the freezing should be resisted, for another week or two, unless the original tumour was of too large a size or irregular a shape to be covered by the circumference of the pencil chosen.

In this connexion the problem sometimes arises how best to deal with some of the peculiar and grotesque shapes that are met with in practice. Patterns may be cut, after tracing out an approximate and rather larger outline of the nævus, on oiled paper. This is laid upon a sheet of cardboard or any other non-conductor, and the approximate shape of the nævus cut out; the cardboard frame is then placed round the nævus, interposed between the skin and the larger-sized freezing pencil, as a more or less accurate shield against freezing of normal tissue. Or, again, the area may be frozen in sections. If this is done great care must be taken to select each of them at sufficient distance apart to prevent overlapping and consequent double dosage.

OTHER USES OF THE METHOD

Early rodent ulcer is another condition for which the pencil may be used, except when it occurs on the eyelid where counter-pressure from bone is not available. In such cases radium is to be preferred. On the forehead or nose CO_2 will give results as good as radium. Sepsis should be first controlled by lotions or ointments, and crusts must be removed before the snow is applied. A minimum exposure for a rodent ulcer is one minute; firm pressure should be used and care taken to ensure that the pencil overlaps the tumour at every point of its circumference. It goes without saying that the treatment should only be used in cases which have not involved the underlying bone, and in which the infiltration is confined to the skin.

For the common wart the actual cautery is preferable, mainly because the papillomatous processes are too deeply situated for effective refrigeration; the flat seborrhœic and senile varieties of wart, however, are rapidly eliminated by snow treatment. Applications with moderate pressure vary from 20–30 seconds, and can be repeated as required. Some forms of keloidal tissue can also be treated in this way, but are best submitted to X ray or radium exposures by an expert. Soft papillomata of various types are also suitable for CO_2 treatment provided their substance is not too fibrous. Conditions other than dermatological in the mouth, rectum, and vagina, and even on the conjunctiva, have been treated by cryotherapy with excellent results.

Clinical and Laboratory Notes

A CASE OF PHLEGMONOUS GASTRITIS

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Miss A. B., aged 41, a clerk, was taken home from work at 11 A.M. on Jan. 18th on account of abdominal pain and vomiting. At 9 P.M. on the same day I saw her for the first time; there was a history of incessant vomiting and considerable upper abdominal pain. The vomiting had come on suddenly that same morning, but she had complained of a little nausea and malaise for a few days before.

Examination revealed considerable tenderness in the epigastrium; there was somewhat indefinite rigidity in the midline between the xyphoid and the umbilicus; she was able to sit up in bed of her own accord and without assistance, and contraction of the recti muscles did not cause her any pain or indeed any apparent discomfort. The axillary temperature was 104·2°, with pulse-rate 100 and respiration-rate 24; the bases of both lungs were clear.

On the morning of the 19th she was removed to Leigh Infirmary because the pulse-rate had gone up to 110. No satisfactory diagnosis could be arrived at as the signs and symptoms were extremely conflicting; the temperature remained in the neighbourhood of 104° with occasional remissions to 101° for an hour or two at a time. The respiration-rate did not rise above 28, and there were no signs of basal or diaphragmatic pneumonia. The pulse-rate went up steadily to 120; tenderness and rigidity quickly became more marked and it was clear that an acute upper abdominal catastrophe had occurred. Gall-bladder, pancreas, and duodenum did not appear to be the origin of the trouble; the most likely lesion to be encountered was considered to be a perigastric abscess with some leakage into the general peritoneal cavity.

I opened the abdomen by a right upper paramedian incision; clear free fluid welled up through the opening in the peritoneum and a large soft red tumour presented itself against the parietal peritoneum; this was the stomach, the peritoneal coat of which was much injected, the walls thick and doughy and of even consistence throughout; the swelling and thickening of the stomach ceased abruptly at the pylorus and all the organs in the upper abdomen, other than the stomach, appeared to be perfectly normal. I made a small incision through the peritoneal, muscular, and submucous coats as far as the mucosa itself; there was gross thickening of all coats, and the submucous coat appeared as a yellowish-white layer—in consistence and appearance very much like cream cheese; on squeezing the stomach wall gently, multiple beads of pus exuded from the submucous coat. A drainage-tube was inserted at the site of incision and also a large suprapubic drain. Death occurred on Jan. 22nd from general peritonitis.

Three hours after death I removed the stomach in toto; uniformly thickened, it was deeply congested on the peritoneal surface from the cardiac orifice to the pylorus. Macroscopically the submucous coat was much in evidence as a yellowish cheesy layer from which pus could be expressed with little difficulty; the mucous membrane was much injected and ecchymosed, more particularly in the pyloric antrum. There was no sign of ulceration anywhere on the mucosa itself, nor was there anything to indicate any trauma which might have been the origin of this extremely grave condition.

To Dr. W. E. Cooke, of Wigan Infirmary, I am indebted for the following histological and cultural report. "Histological examination shows purulent infiltration of all the coats. Cultures give a mixture of *B. coli* and streptococci."

The extreme rarity of this condition, together with the difficulty of diagnosis and the utterly hopeless outlook as far as treatment, either surgical or medical, is concerned, make it worthy of record as followed from the origin of the illness to the post-mortem findings.

ACUTE HÆMOLYTIC ANÆMIA

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A. G. SANDERS, M.B. Lond.
LATE SENIOR RESIDENT AT THE HOSPITAL

A BOY, aged two years and three months, was admitted to the Metropolitan Hospital on August 31st, 1932.

The mother had noticed that on the previous day the child's urine had become dark. The bowels were costive, but the child was said by the mother to be well in himself and "not moody or ill at all." The urine was definitely stated to have always been normal until the day before admission. The child had been taking no medicine. On closer questioning the mother said that the child had had "a bit of a cold for the last week" and that although he had always been rather a pale child, the parents had for the last week "noticed a yellow look about him."

Condition on examination.—Skin and mucosæ pale. Conjunctivæ yellow. Fat child. Tongue moderately furred. Tonsils ragged. Teeth good. Heart not enlarged. Systolic murmur at pulmonary area. Lungs: nil abnormal discovered. Abdomen: spleen palpable. Nervous system: no abnormal signs. The urine was very dark and gave a strongly positive guaiacum reaction, but was free from red corpuscles. Although a spectroscopic test was not performed, there can be no doubt that hæmoglobinuria—or more probably methæmoglobinuria—was present.

Course of illness.—The temperature chart showed an irregular pyrexia, varying from subnormal to 101° F. The blood count showed on Sept. 2nd:—

Red cells ..	1,700,000	Polymorphs ..	55%
White cells ..	28,000	Lymphocytes ..	38%
Hæmoglobin ..	28%	Monocytes ..	7%
Colour-index ..	0·82	Eosinophils ..	0

The red cells showed slight anisocytosis and polychromasia and eight nucleated forms were seen in

differential count of 200 cells. No abnormal white cells were found. The blood belonged to group IV. The Wassermann reaction of the serum of mother and baby was negative.

Two days later the patient's condition had deteriorated, both clinically and hæmatologically: the hæmoglobin was 24 per cent., the red corpuscles were 1,500,000, and the nucleated red corpuscles were larger and less mature—macro-normoblasts. The deterioration took place in spite of injection (intramuscular) of a deproteinised liver extract on each of the first five days in hospital. The white corpuscles were 42,400 with approximately the same differential count as on Sept. 2nd.

On Sept. 5th 10 oz. of citrated blood were transfused. The temperature rose shortly afterwards to 103° for a few hours, but was subsequently never above 100° and only twice above 99°. The accompanying Chart shows

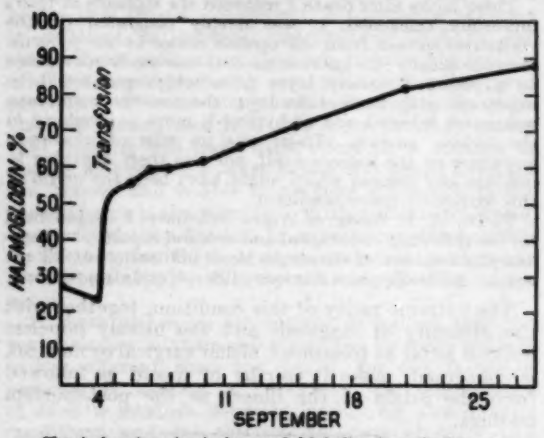

Chart showing rise in hæmoglobin after transfusion on Sept. 5th.

the time relation of the transfusion to the hæmoglobin percentage. Even if we calculate liberally the blood volume of a child of 32 lb., the amount of blood transfused was probably enough to raise the hæmoglobin percentage from 25 to 56 per cent. Thereafter, the percentage kept round about 60 for three days. Three days later the figure was 72 per cent. It would seem that the blood supplied by transfusion tides the patient over a dangerous anæmic crisis. Whether it has any other use is unknown, but it seems to have in addition some special curative value.

Hæmoglobinuria is not a contra-indication to transfusion. In a case described by Parsons and Hawksley [1] a patient with hæmoglobinuria apparently hæmolysed the blood first transfused; and one of Lederer's cases [2] with hæmoglobinuria showed biochemical evidence of transient renal impairment. Although our patient had no ill-effect from transfusion, it might have been advisable to give two small transfusions rather than one larger one. The child was seen again on Dec. 12th, 1933, and was quite well, the red cell count being 5,300,000, the hæmoglobin 80 per cent., and the leucocytes 10,300 with normal differential count. In April, 1934, the child was still well, with normal blood count.

Apart from the benefit derived from the blood transfusion two points in this case call for notice. First, the colour-index was low, whereas most of the others recorded have had a high colour-index. In one of Lederer's cases the colour-index varied, however, from 0·6 to 0·8. Secondly, vomiting was absent, whereas it has sometimes been a prominent symptom. In conclusion, may it be remarked that hæmoglobinuria, which is rather a rare complication of the disease, was the symptom which first attracted the mother's attention.

[1] Parsons, L. G., and Hawksley, J. C.: Arch. Dis. in Childhood, 1933, viii., 184.
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A CASE OF DOUBLE INTUSSUSCEPTION

By S. G. Papadopoulos, M.B. Lond.
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A married woman, aged 21, with a child four months old, was brought to the Nicosia General Hospital with a history of an illness of four days' duration.

She began by having severe abdominal pains in the right iliac fossa with vomiting, but without any fever; the pulse-rate was 80. She passed a little blood per rectum on the first day and again on the third, in this case following an enema. Enemas produced a slightly constipated result. She was treated by her medical attendant on medical lines as acute appendicitis, but as she was losing ground she was brought to the hospital.

On admission she complained of very severe pain mainly in the right iliac fossa. The pulse-rate was 88 and the temperature 99·2° F. She was vomiting. The abdomen was slightly distended and strong peristaltic waves of the intestine could be clearly seen through the rather thin abdominal wall, especially above the umbilicus. The face was rather sunk and looks were anxious, the lips and tongue very parched owing to prolonged vomiting and inability to take fluids for some days.

I provisionally diagnosed intussusception (although I could not feel the sausage-like tumour usually met in these cases) and operated on her within an hour of admission. I made the opening in the middle line below the umbilicus. The small intestine was distended to about three feet above the ileocæcal valve. At this part of the intestine a hard mass was felt which was brought out of the wound. It was found to be formed by an intussusception of the small intestine, and on reduction this was found to have originated from an acutely inflamed hard body, partly gangrenous. On closer examination this was found to be a Meckel's diverticulum, which was invaginated on itself, forming a hard round gangrenous body. It was resected and the opening into the intestine was closed.

The appendix region was then explored when, to my surprise, a second mass larger than the first was found. On bringing it outside the abdomen this proved to be a second intussusception involving the lower 18 inches of the ileum, invaginated into the ascending colon, carrying with it the cæcum and the appendix. By gentle massage and kneading it was reduced, and on reduction the appendix was found inflamed and thickly adherent to the cæcum. The appendix was removed in the usual way and the abdomen closed. Pituitary extract was ordered for the atonic and distended condition of the intestine, and free use of normal saline hypodermically. The patient rallied so well and quickly that it was not found necessary to use acetylcholine.

The interest of the case lies in the coincidence of events which even singly are rarely met. The patient made an uninterrupted recovery.

Research Work at Queen Charlotte's Hospital. At the annual meeting last week Lord Howard de Walden, who presided, said that there had been an increase in the number of patients admitted to the Isolation Hospital at Ravenscourt Park which was built in conjunction with the Bernhard Baron memorial research laboratories as an attempt to tackle the urgent problem of maternal mortality. The work of the laboratories had, he said, been very promising. The demand for in-patient treatment at the main hospital had exceeded its capacity; in-patients admitted in 1933 numbered 2771, an increase of 127. During the year 297 medical students and practitioners and pupil midwives passed through the training schools. The dominant needs are more in-patient accommodation and the endowment of the hospital's research work. To complete the buildings at Ravenscourt Park, and replace the hospital in Marylebone-road, will cost £200,000. The expenditure of the hospital has been reduced by 8 per cent.; last year there was a surplus of £9630.

MEDICAL SOCIETIES

TUBERCULOSIS ASSOCIATION

AT a meeting of this association held at Manson House on May 25th a discussion on the

Palliative Treatment of Advanced Pulmonary Tuberculosis

was opened by Dr. C. D. AGASSIZ. These cases, he said, were the most distressing of all with which the clinician had to deal. Treatment resolved itself into two kinds: psychological and medical. Single or two-bedded wards should be allotted to advanced cases; and in order to prevent any notion that such wards were reserved for the dying there should be also cases with a reasonable prospect of recovery. They should be called observation wards. Many of such patients complained of apparently trivial symptoms, such as pain in the chest, a feeling of tightness or dyspnœa, and so on. The mere listening to the chest with a stethoscope, followed by a judicious word of encouragement would often satisfy the patient who needed the human touch more than anything else. Important points were the provision of suitable literature and games, and frequent visits of relatives, including children. Psychological treatment should also include recreation rooms, workshops, and entertainments. The less medicine given the better—a belief based on his experience in treating children who were dying. If cough and dyspnœa demanded relief heroin as a linctus might give ease, and other sedatives, such as the barbiturates, might be useful; he was sceptical of the value of opium or morphia, which simply prolong the patient's sufferings. For the distressing terminal dyspnœa, oxygen was the only remedy that gave relief, but if once given it was difficult to stop. Pain in the chest was alleviated by hot-water bottles, strapping, or painting with iodine. For sleeplessness medinal or allonal was better than morphia. In tuberculous ulceration of the bowel with painful diarrhœa he had found very few drugs of real benefit; Marcus Paterson's method of giving ordinary diet had in his experience proved of more use. Astringents had no effect, and opium alone would relieve the pain. In tuberculous laryngitis insufflations and cocaine and other sprays were almost useless. Injection of the superior laryngeal with alcohol was a better method of relieving distress, and cauterisation of the larynx would sometimes give relief.

Dr. ERNEST WARD, who followed, said that human sympathy was more called for than a profound knowledge of pharmacology. The complaint, "The doctor is not interested in my case," was too often justified. The patient in his home was attended by relatives who were tired of waiting for the end; nurses and practitioners were bored. Such cases were, however, a real test of the practitioner's ability and fitness for his profession. The chief treatment was mental, the aim should be to imbue courage and perhaps hope. If they could not cure the disease they should at least make the patient as comfortable as possible. He should not be confined to bed, or even to his room simply because he was running a temperature; many patients could get up with advantage right up to the end. It was important to listen to all the patient's complaints, but the practitioner should beware of drugs, unless given in minute doses. Most drugs in therapeutic doses did more harm than good, but troublesome symptoms had to be relieved. For insomnia he found bromidia—a mixture of chloral, bromide, and hyoscyamus—the most efficient hypnotic. Cough was often relieved by tinct. hyoscyam. ℥ v. in a tumbler of water, to be sipped constantly, the frequent swallowing apparently inhibiting the cough reflex. Steam inhalations, he thought, were helpful in relieving dryness of the throat. For abdominal pain and diarrhœa opium was the great standby. Middle-aged patients often felt the cold badly; if necessary fresh air should be cut down—easier to do in the home than at hospital. Pains in the chest were often due to draughts; many patients were susceptible to myalgias. As to diet, Dr. Ward agreed with Dr. Agassiz that the patient should be given what he wanted as far as possible. For the irritable patient he had had some promising results from bulbo-capnine phosphate. For general well-being any normalising influence was important, including reading, sketching, letter-writing, or keeping a diary—not of symptoms but of happenings in the ward or street.

DISCUSSION

Dr. J. WATT said it was well worth while to attend to any symptom complained of. Simply putting the stethoscope to the chest did really help the patient. It would, he thought, pay the authorities to arrange for a specialist to see periodically the advanced cases in general hospitals. The wireless was a tremendous boon in ordinary sanatorium life; no ward for advanced cases was properly equipped without head-phones. Cough could be alleviated by postural drainage, especially at night and early morning. He agreed that treatment of advanced tuberculosis was a question not of drugging but of sympathy.

Dr. G. B. PRICE said he had had the advantage of watching chronic and advanced cases over a period of ten years or more. He had been glad to hear the sympathetic references made by all the speakers to the importance of listening to what the patients had to say, and to the occasional examination of the chest in even the most advanced cases. Even if no fresh observations were made, it did definitely help the patient. The discomfort in advanced cases was largely referred to the stomach; flatulence and atonic conditions were common. Achlorhydria was usually present; the incidence of gastric ulcer in chronic advanced disease seemed to him curiously high. He thought there was room for more observations on the gastric functions in these cases. Myalgia also loomed largely in the picture; he could recall definite arthritis in several of his own cases.

Dr. S. V. PEARSON spoke of the value of intravenous injections of calcium chloride in stopping pain and diarrhœa.—Dr. PETER EDWARDS had found alcohol of use internally as well as in injections of the superior laryngeal nerve. Boxing, bowls, and cricket were useful adjuncts to sanatorium treatment.—Dr. JANE WALKER said that if they had once decided that a patient could not get better, they should say good-bye to all sanatorium rules. Alcohol in some form helped people to sleep. For cough her favourite remedy was a soda mint tablet to suck, but she did not believe that coughing was ever necessary.—Dr. L. S. T. BURRELL agreed with Marie Lloyd that "a little bit of what you fancy does you good." He made considerable use of omnopon and thought it definitely relieved pain. For chronic fibrotic patients complaining of dyspnœa the inhalation of oxygen for a short time every morning might help.—Dr. F. R. WALTERS used glycerin and water with or without lemon juice to stop cough and dryness of the throat. He enumerated some of the commoner mistakes in

bed-making.—Dr. H. TRAYER had found that felsol powder gave relief in dyspnœa. For failing appetite, half a pint of hot water sipped half an hour before dinner was helpful. Brandy, sherry, or port could sometimes be allowed with advantage.

LONDON ASSOCIATION OF THE MEDICAL WOMEN'S FEDERATION

A MEETING of this association was held at B.M.A. House on May 22nd, when Dr. LUCY WILLS spoke on

Tropical Macrocytic Anæmia

Dr. Wills gave an account of her work on this subject during the last five years. In 1928 this condition was described in pregnant women under the title "pernicious anæmia of pregnancy" and was a serious cause of maternal and fœtal mortality in the large cities of India. The blood picture resembled that of true pernicious anæmia, but the condition could be distinguished from idiopathic pernicious anæmia by the following characteristics: (1) earlier age-incidence and the association with pregnancy; (2) absence of natural remissions except after delivery; (3) the presence of free hydrochloric acid in normal amounts in the gastric content of the majority of cases; (4) the absence of a raised indirect van den Bergh reaction or an increase in urinary urobilin; (5) absence of nervous involvement; (6) slight differences in the blood picture—e.g., less poikilocytosis and polychromasia, higher white cell counts. The cases were frequently febrile but no evidence could be obtained of an infective or toxic origin. The general course of the disease and the response to adequate doses of liver or liver extracts suggested a nutritional origin. Further study showed that an identical form of anæmia also occurred among men and non-pregnant women, which also supported the view that the disease was a deficiency state, the higher incidence and the greater severity in pregnant women being due to the added demands on the organism during pregnancy. A dietetic survey among the hospital classes in Bombay revealed a deplorable state of multiple deficiencies, with no significant difference in the diet of sufferers from this anæmia. All the diets were particularly low in vitamins A and C. Experiments with rats fed on diets based on those in common use among sufferers from this anæmia resulted in the production of a macrocytic anæmia, which, however, was associated with the multiplication of Bartonella organisms in the blood stream. A search for similar organisms in the patients gave negative results and large doses of vitamins A and C had no curative effect. Similar experiments with monkeys (Bartonella free) again led to the production of a macrocytic anæmia, but both in the control animals, who were receiving additional rations of vitamins A and C, and in the experimental animals. When the ration of the vitamin-B complex was increased by the addition of Marmite to the diet the anæmia disappeared rapidly. The trial of marmite in human cases was equally successful, 15–30 g. of marmite daily resulting in a maximal response and a rapid rise in the red cell count in both pregnant and non-pregnant cases. At this time Castle and his co-workers were publishing their work on the factors, intrinsic and extrinsic, necessary for the formation of the hæmopoietic factor in liver. As the tropical cases had apparently normal gastric secretion it was assumed that the intrinsic factor was present, but that the missing dietetic factor was Castle's extrinsic factor. After the publication by Dr. Wills of the results with marmite, the Boston workers tried a similar autolysed yeast extract and found that though inactive alone, when incubated with normal gastric juice it was highly active in the cure of idiopathic pernicious anæmia. These workers postulated vitamin B_2 or some factor closely associated with it as the extrinsic factor in pernicious anæmia.

At the same time Dr. Wills said further work with standardised vitamins and yeast preparation in relation to tropical macrocytic anæmia had already been started by her with the help of Miss H. Chick, D.Sc. For the test of these preparations uncomplicated cases under controlled conditions were used, and the activity of a preparation was judged by the height of the reticulocyte peak and the subsequent rate of blood regeneration. Vitamins B_1, B_2, and B_4 were inactive curatively when given in the purest available form—i.e., as acid clay and extract of egg white, or in watery yeast extract of known vitamin potency; further, preparations of marmite free from these vitamins were still active curatively. The vitamin-B complex was, therefore, excluded as the hæmopoietic factor in marmite curative in tropical macrocytic anæmia and also presumably as the extrinsic factor in pernicious anæmia. Further experiments showed that the hæmopoietic factor in marmite was heat stable and was neither precipitated nor inactivated by 80 per cent. alcohol. Whole yeast was inactive, but Dr. Wills suggested that this might be due to the fact that yeast cells are resistant to gastric digestion, rather than to the absence of the hæmopoietic factor.

She summed up the present position as follows: Tropical macrocytic anæmia is a deficiency, dyshæmopoietic anæmia due to the lack of the hæmopoietic factor in the liver known as the pernicious anæmia factor. The disease is distinct from idiopathic pernicious anæmia and is not necessarily associated with diarrhœa, defective gastric secretion, or pregnancy, other causes of macrocytic anæmia. The deficiency is, in her opinion, due to a dietetic lack in some substance present in marmite, which is not one of the known B-vitamins, but which is probably identical with the extrinsic factor described by Castle for idiopathic pernicious anæmia. The tropical anæmia is cured by the administration of the missing factor as marmite or of the pernicious anæmia factor present in liver.

Dr. HELEN MACKAY asked if there was any explanation of the absence of nervous symptoms and natural remissions and of the fact that there was no record of the disease in children, who were normally more susceptible to deficiency diseases than adults.

Dr. WILLS, in reply, said that possibly as regards nerve changes there was not time enough for these to develop in the young patients, but it seemed more likely, in view of the age of some of the non-pregnant patients, that the nerve lesions of true pernicious anæmia were associated with the gastric lesion rather than with the absence of the hæmopoietic factor, which would explain the absence of nerve lesions in the tropical form. She thought that further study might show that remission did occur in exceptional cases, but had no explanation of the absence of recorded cases in children.

ST. JOHN'S HOSPITAL DERMATOLOGICAL SOCIETY.—The Prosser White oration of this society will be delivered by Dr. William Allen Pusey, of Chicago, on Wednesday, June 27th, at 5 P.M., at the house of the Royal Society of Medicine, 1, Wimpole-street, W. The title of Dr. Pusey's lecture will be "Disease, gadfly of the mind, especially the stimulus of disease in the development of the mind."

REVIEWS AND NOTICES OF BOOKS

Relief of Pain in Childbirth

By F. NEON REYNOLDS, M.C.O.G., F.R.C.S.E., Hon. Obstetric Surgeon to the Hospital for Women and Children, Harrow-road, and Southend General Hospital. London: Medical Publications Ltd. 1934. Pp. 114. 10*s.* 6*d.*

THIS book appears at an opportune moment, for the relief of pain in childbirth is now being much discussed both within and without the medical profession. Mr. Reynolds sets out the many drugs and methods advocated for the purpose and gives a judicial summing-up of their merits and demerits while clearly indicating his own preferences.

His chief objective he describes as the humane relief of pain, with consequent conservation of the strength and natural resistance of the patient. The ideal to be aimed at for the pains of the first stage is an analgesic or hypnotic that produces drowsiness, with sleep in a state of complete relaxation between uterine contractions. An inhalation anæsthetic is unsatisfactory in that it leaves the woman wakeful, awaiting with apprehension the next contraction, and making frantic efforts to inhale deeply and rapidly on the first warning of its onset. Anæsthesia deep enough to produce sleep as one pain passes off and to avoid rousing by the next involves long-continued soaking in the anæsthetic. In the expulsive stage, on the other hand, relief of pain during contractions with recovery to consciousness in the intervals is the aim, as thereby the assistance of the patient can be obtained by instruction between the pains. Hence an anæsthetic, rapidly induced and rapidly recovered from, such as nitrous oxide or chloroform, is best. As the moment of expulsion nears, the anæsthesia can be raised to the degree required to remove voluntary control, thus allowing the head to be born as and when the attendant desires; immediate cessation of further administration usually results in the delivery of the body and afterbirth by bearing-down efforts.

Drugs and methods suited to fulfil the requirements for each of these stages are fully discussed in the light of their simplicity, ease of administration, effectiveness, and after-effects on mother and fœtus. The barbiturates are dismissed as dangerous; avertin is said to have the disadvantages for routine use of variable results and of the necessity for calculating dosage and making-up the solution for each case. A rectal injection of paraldehyde in olive oil, with or without a single injection of morphine and scopolamine, is advocated because of its ease of administration, general applicability, effectiveness, and ready combination with other methods in the expulsive stage. For this later period either nitrous oxide with oxygen or chloroform is the stand-by; and the conditions favouring the use of one or the other are fully considered. The possibilities of relieving pain in the woman attended by a midwife only is discussed in an instructive chapter. Crushable capsules of chloroform are not favoured, but it is held that paraldehyde rectal injections which are usually given by the nurse or midwife when working under a doctor, if put up in containers of a single dose ready for use, could safely be left in the hands of the midwife alone and would be effective for all but the pains of the birth itself. For these, for which relief is most needed, some hints are given of what might be done by devising a form of apparatus of the Junker type, so sealed and regulated as to allow only the flow of a weak and intermittent supply of chloroform, sufficient for each pain. The author himself expresses doubt whether or no he is too optimistic in envisaging something of this kind; it is clear that in any case the method must be rendered foolproof and tested by extensive trials before being sanctioned.

The need for attention to minor troubles during pregnancy in order to obtain the confidence and coöperation of the patient is duly stressed, but no mention is made of the possibility of lessening pain and fatigue—and thus lessening the resort to drugs—by instruction of the expectant mother in the part she has to take during labour, by distracting her thoughts from fears and anxieties and by teaching her how to relax completely. Those blessed and most humane weapons, anæsthesia and the forceps, that have so much to their credit have also a debit side; for the pursuit of other means of securing easy and natural parturition has been hindered by the very fact of their ease of application and efficiency. But they should not prevent the methods, to which they are supplementary, from being tried first.

Dr. Reynolds has succeeded in the task he has set himself and his book should receive wide acceptance because of its eminently practical and judicious character. He expresses himself well and clearly, though the over-sensitive may shudder when told "to gently but firmly rub" or on finding that "forceps" is plural. He consistently spells the first syllable of scopolamine with an "a," but seems unable to make up his mind whether "primi-gravidæ" and "multiparas" should be hyphened or not or their plurals be Latin or English. There will doubtless soon be an opportunity of rubbing out these trifling blemishes. The printing is beautiful and adds much to the pleasure of reading the book.

Traité de physiologie, normale et pathologique

Tome V., Respiration. By G.-H. ROGER, Honorary Professor of Physiology; and LÉON BINET, Professor of Physiology in the Faculty of Medicine, Paris. Paris: Masson et Cie. 1934. Pp. 474. Fr.100.

LIKE its companion volumes, this book is made up of articles by various contributors. It opens with a short but valuable section on tissue respiration by Pierre Thomas, which might well have been lengthened at the expense of some less relevant and even redundant material which occurs later. The "considérations histophysiologiques" by Léon Binet which follow are instructive, drawing attention to properties other than respiratory possessed by the cells of the lung alveoli, and to the importance of the lymphoid tissue of the lung. Pulmonary ventilation is treated by the same author. This section seems rather scrappy owing to the number of subheadings such as cough, hiccough, types of respiration; the mechanics of the respiratory movements could have been developed more fully. One does not grudge the space devoted to consideration of the amount of lung tissue necessary to support life and the possibility of actual hypertrophy in the young; this is interesting and instructive, as are the pages dealing with the bronchi and pleura.

L. Dautrebande writes on gaseous exchanges in the lungs and tissues, giving perhaps a little too much

space to methods and to the carotid sinus control of respiration, but finishing with an interesting section on physio-pathological conditions which includes the effects of acute and chronic affections, and a general treatment of oxygen-lack and the various factors which lead up to it. There is some repetition of this matter in the contributions of H. Hermann, C. Heymans, and L. Binet on basal metabolism, nervous control of respiration, and the physio-pathology of some respiratory affections respectively. The section on nervous control is excellent, as was to be expected; basal metabolism, though it necessitates a knowledge of respiratory exchanges, and is here competently dealt with, might have been better placed than in the volume on respiration.

Apart from inevitable overlapping and discontinuity associated with a compilation of this sort—the editors have obviously refrained from any attempt to unify it—the articles themselves are good, and the footnote references which abound cover a wide and representative field. The book is generously illustrated with graphs, tracings, and pictures of apparatus (there is some repetition even here), and contains some very good histological colour plates.

Baths and Medicinal Waters of Britain and Europe

By MICHAEL G. FOSTER, O.B.E., M.D. Camb., F.R.C.P. Lond. Bristol: John Wright and Sons, Ltd. 1933. Pp. vi. + 225. 12*s.* 6*d.*

THE author of this book has peculiar qualifications for his task, since he worked during a long term of years on the Riviera and the Engadine in the winter and at a British spa in the summer months. He has thus been able to distinguish, as few others could do, the effects of a change of climate in a great variety of chronic illnesses from the effects of the systematic use of waters and baths. He points out that at some of the leading spas the course of treatment has "very rightly" developed into a specialty of the place. The results obtained at such spas depend as a rule upon a combination of methods, the result of much clinical adaptation, also on climate and other local characteristics. In Dr. Foster's view, however, the waters come first; some waters, for example, are held to be of definite value in vascular hypertension associated with metabolic disorders, and particular actions have been attached to sulphur waters and others to calcium and alkaline waters. Unfortunately in many spas little attention is paid to the differentiation of hydrological treatment. Another matter in which Dr. Foster's experience is welcome is in the treatment of the type of congestion of the liver met with in the tropics, which occurs even in abstemious persons. It is commonly supposed that a change to England is the main remedial agent, but Dr. Foster holds that the use of waters is of paramount importance. He believes also that gynæcological and cardiovascular cases and many chronic dermatoses could well be treated more specifically at the British spas. He is convinced that a large number of common chronic disorders yield to treatment at an appropriate and well-appointed spa more readily than to a mere change of climate.

In the many diseases known as rheumatic the popular name still "serenely over-rides" the transitory ætiological classifications. Rheumatic fever is only of interest to the hydrologist from the occasional value of cooling baths in hyperpyrexia. But in regard to chronic rheumatism the author wisely emphasises the thesis, too often forgotten, that the first aim of treatment should be to relieve pain. He advises a more extensive use of hot peat baths, in sciatica for example, because they remove the inhibitions of pain. When pain is allayed normal nutrition may return and adventitious deposits may be removed. A similar rule applies to rheumatoid arthritis, and baths furnish powerful means for reducing the "constant trauma" of pain. In osteo-arthritis he advocates brine baths and pools for improving the movement of the joints, and for feeble patients fango packs and local vapour baths.

Brief descriptions are given of the different kinds of waters and baths and their uses. The latter half of the book is occupied with a short survey of the principal British and European spas, founded on the work on "Climatotherapy and Balneotherapy" by Sir Hermann and Dr. Parkes Weber. To this Dr. Michael Foster has now added much new material, which makes the book a valuable and comprehensive guide in the choice of a spa.

Facies Dolorosa

Das schmerzensreiche Antlitz. By Dr. H. KILLIAN. Leipzig: Georg Thieme. 1934. Pp. 88. M.19.60.

THE title of this book does not adequately indicate its contents. It is really an attempt to illustrate the facies of disease, meaning by that not only the organic changes wrought in the face by illness but also the alterations of expression which result from the patient's mental reactions to his malady. The author presents upwards of 60 photographs illustrating different examples of disease which he arranges into nine groups under such titles as facies dolorosa, pale faces, goitres, cachexia, stupor and coma, and so forth. As he is himself a surgeon most of the pictures are naturally of surgical conditions. The artistic excellence and beauty of reproduction of the photographs deserve high praise, but the general effect of glancing through them is one of disappointment. Few of the different sorts of facies depicted are really "typical" of anything, for the fact is that not many diseases have a distinctive facies. The absence of colour also in a photograph interferes greatly with the display of some of the most characteristic changes effected by disease.

A Synopsis of Hygiene

By E. W. CARYL THOMAS, M.D., B.Sc., D.P.H., Barrister-at-Law; Medical Officer of Health, Dagenham. Bristol: John Wright and Sons, Ltd. 1934. Pp. 283. 10*s.* 6*d.*

THIS book, intended for medical students, contains a large amount of information, most of it in summary form. The writer is modern in his outlook and, on the whole, accurate in his facts. The only part which is open to serious criticism is Chapter III., which deals with vital statistics. It is doubtful whether it is worth while trying to convey to medical students the significance of so many statistical terms, but if it is to be done those paragraphs which deal with estimates of the population according to a geometrical progression (not now, by the way, the "method of the Registrar-General"), with the calculation of a standardised death-rate, with the meaning commonly applied to the comparative mortality figure, and with the definition of the infant mortality-rate should be revised in any subsequent edition. For those who can absorb information in a concentrated form the book should be invaluable.

EUGENICS IN PRACTICE

A Series of Essays suggested by the Report of the Brock Committee

IV.—THE CALIFORNIAN EXPERIENCE

AMERICAN experience of legal sterilisation ought to provide exact material for study. Sterilisation laws now exist in 26 States in the Union, and in four others—New York, New Jersey, Nevada, and North Carolina—similar laws have ceased to be operative. Up to Jan. 1st, 1933, a total of 16,066 operations had been performed under these laws, of which 8504, or 53 per cent., were done in California. During the calendar year 1933 a further 578 sterilisations were done in California, not including operation by private physicians on individuals at their own request. In the view of the Brock Committee no entirely independent review of the Californian results has been attempted, and they find it significant that the parole-rate in Californian institutions is equalled by the parole-rate in a large mental deficiency colony in a State which had no sterilisation law. The committee consider that, while there is no evidence of harm done by sterilisation, nothing practical has really been done either. The argument cuts both ways, however, for if it is agreed, as it should be, that sterilisation is not a substitute for institutional care where this is necessary, the limited parole-rate in California may simply indicate that this principle was being upheld.

The Californian statistics refer entirely to sterilisation of the insane and feeble-minded. These patients represent only a small proportion of the group for whom the Brock Committee recommend sterilisation as an appropriate measure, and it would be unfair to judge the merits or demerits of voluntary sterilisation solely in terms of its application to people suffering from mental disabilities.

THE INTENTION

Between 1927 and 1930, under the auspices of the Human Betterment Foundation, the available Californian evidence was published in the form of a series of papers to various medical and technical journals, and in 1930 these 26 papers were collected and published in book form.[1] In California the first sterilisation statute was adopted in 1909; a new law repealing the old one was enacted in 1913 and amended in 1917. The present law provides for the sterilisation, with or without consent, of "any person who has been lawfully committed to any State hospital for the insane or the Sonoma State Home, and who is afflicted with mental disease which may have been inherited and is likely to be transmitted to descendants, the various grades of feeble-mindedness, those suffering from perversion or marked departure from normal mentality or from disease of a syphilitic nature." These rather formidable provisions are modified in practice by the fact that the consent of the patient's relatives is always sought and usually gained before the operation is performed; not one operation in ten, we are told, is performed against the wishes of the relatives, and probably the proportion is really lower. The Act is complicated by penal and therapeutic provisions which might be expected to prejudice its success as a eugenic measure. For example, whenever in the opinion of prescribed officials sterilisation will be beneficial to the physical, mental, or moral condition of certain recidivists in the State prisons, who are also moral or sexual degenerates or perverts, they may order the operation; and the Californian penal code provides for the sterilisation as "additional punishment" of any person adjudged guilty of carnal abuse of a female under the age of 10. Parents might well refuse to consent to a measure which had such penal associations.

There has been a steady increase in voluntary sterilisation in the State, so that in practice this prejudice does not appear to tell very heavily against the success of the Act from the eugenic standpoint. For obvious reasons, however, the extent of such prejudice cannot be estimated, and it is impossible to judge whether it has interfered much with the ascertainment of cases. The element of compulsion in the Act, though used with discretion, may also tend to "drive defect underground," to use the phrase of the Brock Committee. Compulsion, as they pointed out, is likely to defeat itself, for if public opinion is favourable, compulsion is unnecessary, and if public opinion is indifferent, compulsion may convert indifference into hostility.

The aim of the Californian, as of other sterilisation laws, has been to protect the State from the propagation of defective or insane stock, and to stabilise those who, apart from the chance of reproducing their kind, are fitted to take part in community life. Most of the sterilising operations performed in California since the passing of the original Act have been upon insane people in the State mental hospitals; only about one-fifth have been performed on mentally defective patients. At the Sonoma State Home for mental defectives, however, it is now the rule that no patient shall leave the home, even for a short holiday, unless sterilised. In a paper published in 1927 Mr. Paul Popenoe, the very active secretary of the Human Betterment Foundation, estimated that 8·12 per cent., or 1 in 12, of the patients admitted to Californian State mental hospitals had been sterilised since the first law was passed in 1909. Up to June, 1926, 1054 sterilising operations had been performed on mental defectives in the Sonoma State Home. Of the sterilised insane, 47 per cent. of the men and 29 per cent. of the women were still under institutional care; the corresponding figures for defectives were 34 per cent. of the men and 28 per cent. of the women. The Brock Committee regards this aspect of the Californian experiment as profoundly unsatisfactory; they can find no justification for sterilising defectives who are unfit for community life.

THE RESULTS

Opponents of eugenic sterilisation usually fear that promiscuity will be increased among the sterilised with consequent spread of venereal disease; they sometimes suggest that sterilisation may cause physical disability to the patient.

The operations performed in California have been vasectomy in the male and salpingectomy in the female. There is little evidence that these measures have produced physical disability in the patient. We are told that "of 89 mentally defective women questioned after salpingectomy at the Sonoma State Home, 70 reported no change in libido, 12 a decrease, 7 an increase. The group which claimed a decrease was more intelligent than the average." It is, of course, important to know whether these patients had been on parole before they were questioned, and, if so, whether they had had adequate opportunity to estimate any change in their libido. This point is

[1] Collected Papers on Eugenic Sterilisation in California, 1930. The Human Betterment Foundation, Pasadena, California.

not made quite clear in Mr. Popenoe's account. He seems to imply that the women questioned had been on parole and that some of them were married, but there is no definite statement to that effect. He points out, moreover, that the testimony of mentally defective women was not the best evidence on which to base a sound conclusion. Many of them had been sexually delinquent before admission and would therefore be anxious to convince the staff that they were not likely to become sex offenders in the future, and would be inclined therefore to represent themselves as less highly sexed than on admission.

Of 36 men committed to the Californian State hospitals for mental disease, 22 noticed no change in their sexual life after vasectomy, 9 reported an increase of sexual activity, and 5 a decrease. None of them experienced any distension or pain in the scrotum following the operation. In this case the information was obtained by sending a questionnaire to patients discharged from the State mental hospitals. As the psychoses affect the sexual life of the patient, recovery from a psychotic state would be likely to lead to a change in libido; so that this evidence is not above criticism. Of a group of 65 normal men upon whom vasectomy had been performed by their own wish, 9 reported that libido was greater than before, 45 that there was no change, and 2 that libido was decreased, and their statements probably deserve to be taken at face value.

Among the cases followed up, there was no evidence that sterilisation had any influence on the failure of patients on parole. Of those patients paroled, about whom information was available, 73 per cent. of the boys were successful and 65 per cent. of the girls. Success was taken as meaning that the interests of society were as well protected as if the patient had remained in the home. In a series of 107 boys on parole, 78 were successful, 1 doubtful, and 28 unsuccessful. Only 9 of the failures showed criminal tendencies, and in 1 alone—an exhibitionist—was there any sexual element. In a series of 304 girls on parole, 189 were successful, 18 doubtful, and 97 unsuccessful. Altogether there were 25 cases (8 per cent.) of sexual delinquency in the series. That is to say, 1 girl in 12 became sexually delinquent when released on parole; but it must be noted that 9 out of 12 of these girls had been sexually delinquent before sterilisation and that the figures showing success on parole compared favourably with those of institutions of other States where sterilisation was not practised. Out of 2000 feeble-minded insane women sterilised, five or six were reported to consider their infertility an asset because it freed promiscuity from the fear of pregnancy. Others, of course, may have said nothing and thought the more. No instance of the kind was reported among 3000 sterilised men, but since society regards the unmarried father more indulgently than the unmarried mother, male patients were presumably indifferent about this point.

The evidence of probation officers who had had the opportunity of observing large numbers of paroled patients over a period of years indicates that sterilisation has not increased the amount of promiscuity but has tended to diminish it, and that the chances of spread of venereal disease have decreased to a corresponding degree.

MARRIAGE AFTER STERILISATION

In one respect sterilisation has been decidedly successful. The marriage of an unsterilised defective patient can only be regarded as a catastrophe to the State, since it is idle to expect a mentally defective person to practise birth control successfully or to exercise self discipline. Many sterilised defectives who marry, however, become more stable and live happy competent lives. This is especially true of the women who, in the Californian experiment, were found to be highly sexed and anxious for marriage; the feeble-minded men, on the other hand, were undersexed and lacking in attraction. Among 129 sterilised patients leaving the Sonoma State Home there were 136 marriages (several patients having married twice). In all except five cases the persons marrying were women. No recent information was available about 29 of the marriages of women, but two-thirds of the remaining marriages were successful—a proportion which is thought to correspond with the average successful marriage-rate in California.

The marriage-rate among insane patients was found to be considerably below that of the general population at all ages. Though the male patients married at all times, the female marriage-rate remained almost constant after the age of 30. In general, it was found that no large group of institutional insane in California would produce enough children wholly to reproduce themselves even if the members of the group were all unsterilised. No comparable statement of the fecundity of the feeble-minded is included, but it is said that among 25 girls successful on parole and now occupied in the management of their own homes, 11 have a total of 45 living children which they had borne, legitimately or otherwise, before sterilisation. This suggests that fecundity was high in the feeble-minded group and that sterilisation has enabled some girls to be released who would otherwise have needed segregation.

THE LONG AND THE SHORT OF IT

Most patients and their relatives appear to be pleased with the results of the operation; out of a series of 173 patients, 132 were satisfied and 22 indifferent; 19 expressed dissatisfaction, of whom only 1 is said to have offered a cogent reason. "In a steadily increasing number of cases," we are told, "the relatives urge sterilisation, or send the patient primarily for that purpose."

But Californian experience is by no means overwhelming evidence in favour of sterilisation. If the insane ordinarily propagate too little to increase the size of their group, and if the parole-rate of mentally defective patients cannot be increased as a result of sterilisation, it looks at first sight as though nothing much had been achieved. The gain, however, though small is positive; for if the birth of even a small number of defective children, or children with a psychopathic tendency has been prevented, it is an advantage. Furthermore, individual patients have undoubtedly benefited by the operation—notably, those women who have married successfully but who would otherwise have had to spend their lives under institutional care. The latest report of the Foundation (Feb. 13th, 1934) suggests that medical officers, probation and parole officers, and social workers are all well satisfied with the operation of the law. Mr. E. S. Gosney, who was responsible for the Californian investigation, sums up the position in the preface to the Collected Papers by saying that sterilisation is not a short cut to any eugenic millennium, but is an invaluable supplement to the recognised protective measures.

THE Marquess of Bath recently opened a new wing of the Bridgwater Hospital. Extensions include a new casualty department, ear, nose, and throat, and ophthalmic departments, a new lecture room for nurses, new private wards and adequate sleeping accommodation for night nurses. The cost has been £11,000.

THE LANCET

LONDON: SATURDAY, JUNE 2, 1934

DEATH AND DAMAGES

THE Lord Chancellor's Law Reform (Miscellaneous Provisions) Bill, designed to remove legal anomalies and uncertainties in the recovery of damages where one of the parties has died, has a special application to claims arising out of road traffic casualties. It proposes to abolish certain recognised injustices, yet apparently it will not take the opportunity to give a much-needed remedy to the hospitals and the medical profession. The origin of this new effort towards law reform is the curious survival of a legal maxim apparently peculiar to the English legal system—namely, the doctrine that a personal action dies with the person. The effect of the maxim has been alleviated by judicial decisions and by statute, and its application to claims based on contracts is incomplete. So far as claims for damages for negligent driving are concerned, the maxim means that the victim of a collision is debarred from all remedy if the negligent motorist dies. It follows that the liability of insurance companies under third-party-risk policies comes to an end with the defendant's death and the principle of compulsory insurance is defeated. Conversely, if it is the victim of the motorist's negligence who dies, his children are prejudiced at present in their effort to obtain damages. It is true that, if the father has been killed, they have a special remedy under the Fatal Accidents Act of 1846, commonly called Lord Campbell's Act; but this statutory remedy is not available for adopted or illegitimate children, nor does it cover medical or funeral expenses. Such are the admitted anomalies for which the Lord Chancellor invited the Law Revision Committee to find a cure.

The distinguished lawyers who form the Committee lately presented a report (Cmd. 4540, H.M. Stationery Office. 2*d*.) and their recommendations were embodied in a Bill which has already been approved by the House of Lords. If the Bill becomes law, death will no longer be a bar to legal claims; all causes of action (except claims for defamation or seduction) on which the dead man might have sued or been sued will survive for or against the benefit of his estate. Nevertheless a notable limitation is to be allowed to remain. If anyone dies as the result of a motorist's carelessness, the dead man's estate will be able to recover only the funeral expenses and certain out-of-pocket payments incurred before death. It will still not be possible to obtain damages for the general loss caused by the death or for the mental and bodily suffering which preceded death. This limitation was officially explained during debate in the House of Lords as being due to the difficulty of calculating the loss or putting a figure upon the suffering. Supposing, said the Lord Chancellor, it was a celebrated surgeon who was killed: it would be hard to assess the loss which his death inflicted upon his estate. To laymen this explanatory argument may sound unconvincing. They are probably aware that, if the celebrated surgeon was merely crippled and not killed by the accident, a jury would be expected to fix the damages due to his enforced inability to continue his practice. Laymen may also be surprised that the Bill proposes to allow funeral expenses to be recovered in such cases but not the expenses of medical or hospital treatment. There is no difficulty in ascertaining medical fees or hospital payments if a patient is alive; why is there to be any difficulty when the patient dies? If the estate of the victim of a fatal motoring accident is to be entitled to recover the funeral expenses from the negligent motorist, why should not the latter also pay the doctor and the hospital as well as the undertaker? Why does the law once more leave the doctor and the hospital to bear the loss?

RADIOGRAPHY OF THE MASTOID IN ACUTE OTITIS

THE indications for operation in suppuration of the middle ear are a perennial source of interest to general practitioners as well as to otologists. Prof. HUGO FREY, in a lecture reported in the *Journal* of the American Medical Association of Vienna,[1] makes some wise comments on the factors which have to be considered. Apart from the very mild cases which do not go on to suppuration, acute otitis is always characterised by a purulent inflammatory process of the mucous membrane which affects not only the mucosa of the tympanic cavity, but the coating of all the other spaces of the middle ear—namely, the Eustachian tube, attic, antrum, and mastoid cells. In most cases the inflammation becomes severe in the first few days after the onset, and spontaneous perforation of the drum membrane does not usually occur until the fourth or fifth day; in such cases it is advisable to incise the membrane as early as possible, since the slight operation not only brings about a more rapid disappearance of the pain and the fever, but doubtless also has a good effect on the intensity of the process. It is important to remember that there are forms of acute otitis in infants in which the temperature is almost the only symptom, and otoscopic examination shows only minimal changes; but in these cases also paracentesis must be performed.

This acute inflammation usually subsides after three or four weeks, and operation is therefore not necessary for the cure of an otitis confined to the mucosa, but only when the process of inflammation spreads to the underlying bone. The usual clinical indication for operation is when, generally about the third or fourth week and after the temperature and pain have disappeared, they set in again; tenderness over the mastoid, which is nearly always present at the beginning of an otitis, comes on

[1] Ars Medici, 1934, No. 3, p. 99.

again, and the posterior wall of the auditory meatus sinks. Fluctuation over the mastoid is no longer waited for to-day; but in young children, in whom the petro-squamous suture is still open, we are sometimes surprised by the appearance of a retro-auricular abscess. However, the development of an abscess in the mastoid process is not always accompanied by such acute symptoms; there may often be fairly extensive destruction of bone without high temperature or severe pains. Clinically, such a condition can be diagnosed when an acute otitis is not completely cured in the course of four or at the most five weeks. The secretion may continue, if only very slightly, and when there is still a pressure sensitiveness, no matter how slight, at the root or the tip of the mastoid process, abscess must be suspected; it may indeed be present even in cases where there is no longer discharge but the drum membrane is not entirely normal and, which is very important, the hearing capacity has not been satisfactorily restored. The severe intracranial complications may appear even in the first few days in the so-called malignant form of acute otitis, and in such cases surgical intervention is necessary at the very beginning.

The indication for operation in acute otitis can be supported by X ray examination of the bone, but it requires special practice and experience to make correct pictures of the ear, and also to be able to interpret them. The following points are mentioned by FREY: a veiling or shadowing of the mastoid cells does not mean that an abscess is present, for this may also be seen in cases of uncomplicated otitis, since the mucous membrane of the cells is always involved in the inflammatory process. It is an entirely different matter when the septa between the cells disappear or become indistinct, for a destructive process can then be assumed with certainty. It is always absolutely necessary to prepare comparative pictures of the healthy side, and in doubtful cases it is advisable to repeat the examination, for this is the best way of recognising a progressive process. In any case, an X ray picture taken before operation gives information as to the extent and form of the pneumatic system and the topography of the adjacent cranial fossæ.

Dr. P. COTTENOT, of Brussels, recently described [1] the positions which he recommends for radiography of the mastoid. He agrees with Prof. FREY that a comparison with the opposite side is essential, that a shadowing with diminution of the transparency of the mastoid cells is to be found in simple acute otitis without clinical signs of mastoid involvement, but that a mastoid focus can be diagnosed when destruction of the intercellular septa is seen. A skiagram of the mastoid is of no diagnostic value unless it shows the details of these septa, which are very delicate and often only slightly visible; such a picture should be sufficiently clear and fine to be examined through a lens. Here more than anywhere in the body the results of radiography must only be interpreted in conjunction with the clinical findings. Dr. R. THIENPONT, of Antwerp, comes to similar conclusions.[2] In addition, he believes with WITTMAACK that the course of an acute otitis is peculiarly influenced by the form of pneumatisation of the mastoid process, and that radiography, by showing this, has its principal value in prognosis. According to this theory, a normal or "mesoplastic" mucosa, with complete and regular pneumatisation, is rarely attacked by acute inflammation. Three degrees of hyperplasia of the mucosa are distinguished: (*a*) a highly hyperplastic mucous membrane with complete arrest of pneumatisation is likewise rarely attacked; (*b*) a moderate degree of hyperplasia with partial arrest of pneumatisation is particularly predisposed to acute inflammation; and (*c*) in the slightest degrees of hyperplasia there is but very little tendency to inflammation. A condition of hypoplasia can also influence the acute inflammatory process; thus, the most advanced degrees of fibrosis, often the result of previous inflammation, are not easily infected, but the less extreme hypoplasias do not always escape. Dr. THIENPONT holds that these various conditions may be recognised by radiography, and that valuable aid to prognosis can thus be given; but it cannot yet be said that his postulates have been proved.

[1] Paris Médical, Feb. 3rd, 1934, p. 95.

[2] Bruxelles-Médical, March 18th, 1934, p. 641.

HEALTH INSURANCE AS "SOCIALISED MEDICINE"

THE American Medical Association at their annual meeting in Cleveland, Ohio, on June 11th–15th will give special consideration to the question of introducing some form of compulsory health insurance into the United States. Hitherto the Association have strongly opposed health insurance, regarding it as a form of "socialised medicine," even where insurance medical services are provided through the panel system, and therefore repugnant to the rugged individualism of the American people; and any attempts to discuss the subject at the annual meetings have been, if not actually burked, at all events not encouraged. There are now unmistakable signs that the rank and file of the profession are dissatisfied with this way of dealing with so important an issue, and a lively discussion may be anticipated at the Cleveland meeting. For the purposes of the discussion the association's bureau of medical economics has prepared an elaborate report on "The Insurance Principle in the Practice of Medicine," which purports to set out the effects of health insurance on medical practice in Europe. The report, though written with outstanding ability, is, on the whole, a disappointing document. One naturally expects documents written by Americans for Americans to be before all things up to date; and this report, admirable in many respects, is certainly not up to date; it is almost wholly given up to criticisms of the oldest health insurance system in Europe—namely, the German—which from the insurance doctor's point of view is also the most unsatisfactory.

The defects of the German system were well known to the medical profession of this country 25 years ago, and it was to prevent the introduction of those defects into the British insurance system that the British Medical Association entered upon their campaign of the "Six Cardinal Points." The points embodied certain basic principles of insurance medical practice for which the German doctors have for 50 years striven unsuccessfully to secure: separation of medical services from cash benefit administration, statutory right of every doctor to undertake insurance practice, free choice of doctor, selection by local doctors of the local method of medical remuneration, effective participation of doctors in the central and local administration of the system. Medical benefit in the British system has been based on these principles since its inception 22 years ago, and with the introduction of the system health insurance entered upon a new phase; in countries that have since adopted compulsory insurance—France, for example—the doctors have profited by the experience of their British colleagues. At this time of day it is unnecessary to concentrate attention on the German system. It is by an open-minded study of the British system that an inquirer may most readily appreciate the issues involved in the introduction of compulsory health insurance; and it is surprising that the American Medical Association, in a document prepared to furnish the facts most material to the forthcoming discussion, should have dealt so inadequately with what the British doctors have done to place insurance practice on a satisfactory basis. The statements that are made are so brief that some are misleading or inaccurate; it is said, for example, that "confinements" are among the services provided, whereas attendance on a confinement is expressly excluded from the panel doctor's duties—an important point to bear in mind when considering the amount of his remuneration.

We hope that the American Medical Association will supplement their studies in German health insurance by giving some attention to what has been done in this country to bring insurance practice into harmony with the true traditions of the medical profession. After all the Briton is as full of "rugged individualism" as his American cousin, and the spirit that took the *Mayflower* across the Atlantic still lives in the old country, to the irritation of a certain reforming type. Our insurance system was not imposed upon us by a dictator, but freely accepted as a valuable measure of social reform, and in developing the system there is no terror of "socialised medicine," which may mean anything or nothing according to what is in the minds of those who use the phrase.

X RAY DIAGNOSIS OF LOBAR PNEUMONIA

THE importance of radiography in the diagnosis of chronic thoracic disease is now generally recognised and a radiogram is rightly regarded as an essential part of every complete investigation of the chest. Its application to the diagnosis of acute disease has been limited by the difficulty of adapting apparatus suitable for chest work to use at the bedside. In some acute diseases, such as pulmonary abscess or empyema, the slight risk involved in moving the patient from ward to X ray department is so much less than those of a hesitating diagnosis that the lesser of two evils has always been rightly preferred. The portable X ray unit, which enables the physician to obtain a picture of the patient's chest with less strain to the sufferer than is entailed by a physical examination, should facilitate still further the investigation of these types of disease, and even apply to conditions such as pneumonia in which the removal of the patient from his bed entails unjustifiable risks. The provision of a portable set will ease the burden of responsibility resting upon the physician who has had to depend upon physical signs alone to determine whether the patient is suffering from a simple pneumonia or one complicated by sepsis within or without the lung parenchyma. The importance of such early diagnosis in pneumonia has become much more evident since the introduction of Felton's serum. Radiography may also be expected to tell us something of the manner in which pneumonia commences, develops, and resolves.

Interest thus attaches to a series of 40 cases of pneumonia which have been kept under radiological observation at Chicago during the course of the disease. In reporting these[1] the authors have endeavoured to correlate X ray findings with deductions based on the results of physical examinations. Experience gained in recent years from the radiographic study of chronic disease prepares us to anticipate their first and, from the practical point of view, their most important finding. None of the skiagrams taken later than 24 hours after the onset of symptoms failed to show abnormal shadows in the lungs, although at this early stage of the disease abnormal physical signs might be lacking or so slight as to be difficult of interpretation. Further, X rays proved to be more accurate than physical signs in determining the extent of disease until the stage of maximum consolidation was reached, when both methods proved equally trustworthy. The cause for this discrepancy is to be sought in the site of the original pneumonic focus which is generally deeply situated. Lesions so placed may be entirely beyond the reach of percussion and auscultation, as radiograms of tuberculous chests have abundantly proved. A consideration of symptoms and the result of X ray examination may thus enable a diagnosis of pneumonia to be made with some confidence at a stage when neither impaired percussion note, bronchial breathing, nor hair crepitation can be demonstrated.

It must not, however, be supposed that a radiogram of a pneumonic lung will provide a characteristic picture diagnostic of the condition without regard to symptoms or to the patient's general condition, in the way that a skiagram of a chest may supply conclusive evidence of phthisis without reference to history or symptoms or

[1] Graeser, J. B., Ching Wu, and Robertson, O. H.: Arch. Internal Med., February, 1934, p. 249.

physical signs. There is, for example, little to distinguish the shadow of a consolidated upper lobe in an acute pneumococcal infection from the shadow cast by an epituberculous lesion of a lung. Radiology has further demonstrated the entity of a variety of pneumonia, or at any rate of pulmonary consolidation, which is unaccompanied by symptoms of acute disease or respiratory distress, and is indeed not seldom discovered during the routine examination of the chest of a catarrhal child. Again, an atelectatic lung may be indistinguishable from a pneumonic lung if X ray appearances are alone taken into account. This condition has indeed been held by some to be an essential feature in pneumonia, but no evidence of atelectasis was discovered in any of the cases under review. A slight degree of mediastinal displacement towards the affected side was, however, noted in some instances, though more commonly a slight elevation of the diaphragm was evident. Such changes are evidently necessary to compensate the diminished expansibility of the partially consolidated lung.

ANNOTATIONS

DENTAL CARIES AND ORAL HYGIENE

In an address from the chair at the final session of the third Dental Board appointed under the 1921 Act, Sir Francis Acland said that the most important piece of investigation on the medical side was that which had recently been concluded by Mrs. Mellanby. It was very difficult for any layman, and perhaps for anyone, he said, to give an account of this work, which would at the same time do it justice and satisfy all those interested in the problems investigated, but he would attempt some observations on the subject if only to draw attention to the great importance of the work. Mrs. Mellanby had shown without doubt that teeth of good structure could be produced in certain animals by the administration of a dietary having a low cereal content but rich in vitamin D. Her more recent investigations had shown, in his opinion, that similar results could be produced in human beings. She claimed also that defective structure due to unsuitable dietary and caries in human beings went hand in hand. "I believe," said Sir Francis, "there is strong evidence for this already, and that further evidence will establish it. The question will, however, remain as to the importance of environment as compared with structure, and it will appear to many that in the present state of our knowledge Mrs. Mellanby may be going rather too far when she states that factors other than structure 'may play a part, although a secondary part, in the onset and prevalence of the disease.' We have not, I think, yet sufficient facts for the full elucidation of this problem. There was, for instance, during the investigations conducted upon the effects of different dietaries on children, a considerable increase in the number of carious teeth in the children receiving the dietary which Mrs. Mellanby would recommend, and on this her comment, which I believe to be probably true, would probably be that the special dietary was not started early enough, and should have been applied during the antenatal period and infancy. Further investigation may establish the fact that caries-proof structure can be built up in this way, but the difficulty of securing the right dietary throughout the whole period of tooth formation will, I think, make it unwise to relegate oral hygeine to a definitely inferior position. Its practice, hitherto, as Mrs. Mellanby quite truly says, has not resulted in any marked decline in caries, despite all that has been talked and written about the subject. But this may be due rather to the incomplete way in which the teaching has been applied than to error in the teaching itself. I, for instance, do not find it easy to finish my meals with detergent substances, and I cannot persuade myself that it is not useful to remove from the teeth with a toothbrush that which adheres to them as the result of meals. It would be useful, it seems to me, if it were possible alongside of a more complete experiment which would probably more completely establish Mrs. Mellanby's conclusions as to the importance of diet in structure, to conduct also more complete experiments than any which I believe have yet been possible upon the effects of perfect environment, apart from attention to diet. These comments are not in any way meant to throw any doubt upon the very high value of Mrs. Mellanby's work; on the contrary, I believe that it marks a very great advance towards a final conclusion. It challenges, and rightly challenges, some hitherto prevalent theories, and it must be the basis of all further work on the subject."

HOUSING, POVERTY, AND MORTALITY

The Registrar-General's annual review of the statistics of England and Wales shows year by year that as we move northwards the rate of mortality progressively increases. This relatively unfavourable mortality experience of the north is apparent in each type of administrative area—county borough, urban district, and rural district—and is most distinct in the early years of life, especially the second year. It is not difficult to suggest a number of natural and acquired characters of the more northern areas that may have a bearing upon the greater mortality risk—e.g., colder climate, smoky environment, occupational risks, density of population, and (perhaps) harder economic conditions. The difficulty lies in determining the actual importance of each such factor and in measuring the contribution they individually make to the excess in mortality. A very interesting study of the data has been made by Dr. Percy Stocks in a paper read before the epidemiological section of the Royal Society of Medicine on May 25th. He first notes that if we divide up Great Britain into successive zones of latitude (omitting London), then as we move northwards there is a progressive increase in the mean density per room until the Scottish industrial area is reached, where the density is 86 per cent. in excess of that in the southernmost zone. By statistical means he disentangles the influence of the two factors, latitude and density, and concludes that at ages over 5 there is no reason to suppose that mortality from all causes combined is appreciably affected by climatic differences dependent upon latitude within the limits of England and Wales. The mortality of young children from respiratory disease, however, does show an increase in passing from the south coast to the industrial north, as much as 42 per cent., even after allowance has been made for the effects of the increasing density and crowding per room. Similar, though slighter, changes were observed in

infant mortality from causes not congenital, which may be presumed to be due also to the respiratory diseases which form the bulk of these deaths. An analysis of the sunshine records derived from stations in the different latitudes leads Dr. Stocks to advance the belief that these special effects of geographical area upon the mortality of young children are the result of diminished sunshine, which, leading to rickets, lowers resistance to respiratory and other infections.

Apart from this he finds no evidence that the differences in average mortality experiences between different parts of Great Britain can be ascribed to climate, and he turns to a more detailed analysis of the influence of density as measured by persons per acre and persons per room. The latter, he finds, shows the closer association with mortality; in fact up to middle life the importance of crowding per room appears to be almost double that of density per acre. The largest increase in mortality as overcrowding increases is found at ages 1–5, so that it is in these early years that the greatest benefit from improved housing may be looked for; the differences diminish but are still appreciable at the school ages, expand again for young adult females, and then steadily decline with advancing age. To what extent this association of mortality with density per room is due to overcrowding per se is a question of obvious importance, but not one to which a satisfactory answer can be given. Some believe that social selection plays a part, the less fit through their lower earning capacity gravitating to the most crowded houses. Overcrowding is certainly highly correlated with poverty, but it is Dr. Stocks's belief that the whole explanation of the excessive death-rate in the more densely occupied areas is not to be found in economic differences. The disease most likely to react to privation and overcrowding is phthisis, which many workers have shown to be particularly sensitive to social conditions. This association between tuberculosis and poverty has been made the subject of study in the second bulletin issued by the Committee against Malnutrition,[1] where special attention is given to the effects of the present economic depression.

In this bulletin the death-rates from respiratory tuberculosis are compared between the aggregate of 16 specially depressed county boroughs and the remainder of the county boroughs of England and Wales. In the former the mortality has declined between 1925–27 and 1930–32 by 5·1 per cent., in the latter by 9·0 per cent., so that in the more recent years the depressed boroughs were in a relatively more unfavourable position. On the other hand it must be noted that all the towns in this group except one showed an absolute decline in phthisis mortality, though in three the improvement is very slight. These results can hardly be taken as more than suggestive, since crude death-rates are utilised, and it is well known that the decline in mortality from phthisis has affected differentially the various age-groups and the two sexes; further, the method of aggregating the depressed towns may give undue weight to the movements in the larger components and disguise the change in the smaller towns. A much more detailed analysis is essential before we can accept the committee's conclusion (based also upon the reports of various medical officers) that "danger signals have appeared, even in England and Wales, indicating that, in not inconsiderable areas of the country, underfeeding or the other accompaniments of poverty have become sufficient to constitute an insidious danger to public health by influencing the morbidity and mortality of this disease." There appears to be more justification for the deduction from the class inequality of tuberculosis mortality, that the creation of a generally more favourable social background might significantly increase the rate of decline in the death-rate without any further advance in therapeutic knowledge—though the possibility of heritable factors contributing to class differentiation must not be overlooked.

[1] Published by the committee from 19c, Eagle-street, W.C. 1, May, 1934.

NATURAL PERFUMES

WE have received the following notes on the manufacture of natural perfumes, and the writer desires to express his indebtedness to M. J. Henri Moutet, of Grasse, through whose courtesy he had the opportunity of seeing in operation the processes which he describes, and so learnt much as to the methods of an interesting industry which at this particular season of the year is at full blast. He writes:—

"The ancient art of the perfumer still flourishes at Grasse and in the surrounding district. Here the odoriferous principles of plants grown in the neighbourhood are extracted either by steam distillation, extraction direct by solvents, or for the more delicately perfumed ones the old pomade or enfleurage process is employed. Under this process the functional activity of such flowers as jasmine, jonquil, tuberose, and mignonette goes on while they are packed between glazed frames supporting films of beef fat or lard, or on cotton fabric impregnated with olive or mineral oil. The absorption by the fat or oil during the period of exposure yields from six to twelve times the amount of perfume obtained by other processes, and of a finer quality. This, it may be supposed, is due to the continued production of perfume by the plant which is not killed, as in other processes by a high temperature or chemical poisons. Great care is taken to use fats and oils so prepared as to have no bad odour and not to develop rancidity when stored for years. The pomades thus obtained may be used as such for perfuming fatty preparations or may be stored until an 'extrait aux fleurs' is required, when they are extracted with strong alcohol, any dissolved oil is frozen out at a temperature much below 0° C. If the concentrated perfume is required the alcohol is distilled off under reduced pressure, thus avoiding the possible destructive action of heat.

"Distillation in a current of steam from an alembic is used for roots, trunks, branches, bark, previously torn up or reduced to sawdust, for leaves, flowers, and berries which are sometimes crushed first. A variant of the enfleurage process is used for violet flowers (Parma and Victoria), rose de mai, orange flower, and cassia. In this the flowers are digested for an appropriate period in purified fat or oil raised to 60–70° C.; when extraction is considered complete the molten pomade is separated from water liberated during the process and the marc is subjected to hydraulic pressure to remove the last of the pomade from the residual tissues. Extraction by volatile solvents is also used, the most commonly used being petroleum ether of low boiling point (40–50° C.) and almost odourless. The substances to be extracted are lixiviated at ordinary temperature by the solvent, which is then evaporated, leaving 'cires parfumees' which yield cloudy solutions with alcohol and may be purified by freezing and filtration, yielding liquid 'essences absolus.' An intermediate solid product is known as 'essence concrete.'

"Among the plants or their parts which are grown in the Alpes maritimes, the Var, or neighbouring departments, and are treated at Grasse, are: aspic (spikenard), angelica, basilique (basil), camomile, céleri, ciste (rock rose), cypres, estragon (tarragon), fenouil (fennel), genièvre (juniper), geranium, hysope, marjolaine (marjoram), menthe (mint), melisse (balm), oranger feuilles, oranger fleurs, persil (parsley),

romarin (rosemary), rose, sabine (savin), sauge (sage), serpolet (wild thyme), tanaise (tansy), chèvrefeuille (honeysuckle), freesia, genêt (broom), jacinthe (hyacinth), jasmin, jonquille, lavande, lys, magnolia, mimosa, mousse de chêne (which is literally oak moss and is recognisable as a much used scent base), muguet (lily of the valley), narcisse, œillet (carnation), reseda (mignonette), rose de Mai, tuberose, violet flowers and leaves. The names of these are mostly obvious, but Neroli, which is an orange scent, is called after its inventor; patchouli is distilled from the dried leaves of pogostemon patchouli, a member of the great scent-bearing order labiacæ, a plant cultivated in the Straits Settlements, Penang, Java, and other tropical places. Owing to adulteration of the Asiatic product the dried leaves are sent to Europe and distilled at Grasse. Cuscus grass (andropogon muricatus) yields 'vetiver' from its roots, although the leaves are almost odourless, and is imported from India.

"All the products mentioned are prepared at Grasse from natural sources, which are considered to yield finer perfumes than can be obtained synthetically—in fact, the use of synthetic bodies alone is unusual in the production of high-class perfumery. Most natural perfumes seem to be mixtures of several compounds, products of the vital processes of plants. Although the ketone ionone (usually a mixture of the α and β ketones) is known as artificial violet, it —or its two constituents—is usually mixed with many other artificial and natural odoriferous products in making violet perfumes. It is even doubtful whether this or other synthetic odoriferous compounds actually occur in the plants whose odours are simulated. Their use in many cases is mainly as carriers for the more delicate natural product."

It is evident that there are directions in which the effortless syntheses of living cells hold their own easily against the more violent methods of the laboratory.

CONTROL OF COMMON INFECTIOUS DISEASES

THE current methods of control of the common infectious diseases—scarlet fever, diphtheria, measles, and whooping-cough—were the subject of discussion by the Society of Medical Officers of Health on May 25th, Dr. Charles Porter presiding. Dr. H. Stanley Banks pointed out that, whatever its real utility as a measure of control, the public demand for the hospitalisation of scarlet fever continues almost unabated and, in his opinion, is justified by the prevention of sequelæ which is made possible by adequate treatment. As the result of his experience in a series of some 2500 cases injected with scarlet fever antitoxin by the intravenous route, Dr. Banks is convinced of the outstanding superiority of this route over the intramuscular. The complication rate amongst patients so treated is, he says, reduced almost to vanishing point. This view accords with that of most experienced workers that the early injection of scarlet fever antitoxin has a favourable effect not only on the initial toxæmia but on the complication rate, and permits of an earlier release of the patient from hospital, though this is not admitted by all. There has been within recent years a general shortening of the period of detention from the classical six weeks to four; Dr. Banks finds that after intravenous injection of serum patients may safely be released in about a fortnight, especially if they attend an out-patient clinic or are subject to some scheme of supervision for a week or two longer. In his experience the return case rate is not increased as the result of very early discharge; it has been well under 3 per cent. in his series.

On the question of control of diphtheria Dr. E. H. R. Harries voiced the general opinion that the only adequate method of control is the active immunisation of susceptible children. In view of the continued high incidence and unnecessarily high fatality-rate of the disease he expressed the hope that the introduction of large-scale immunisation might not be unduly delayed in this country. At the present time diphtheria is prevalent, and tends to be of a severe type. Dr. Harries deplored the continued misuse of the swab as a chief means of diagnosis of a clinically recognisable condition. Diagnostic swabbing may lead on the one hand to fatal delay in the injection of antitoxin, and on the other to the erroneous diagnosis of diphtheria in patients who are harbouring harmless diphtheroids. Patients diagnosed clinically should be sent into hospital at the earliest possible moment, he said, or at least they should be given antitoxin pending diagnosis. Several medical officers of health spoke of the difficulty of persuading practitioners not to wait for the result of a swabbing before injecting antitoxin. Dr. Harries thought that the reluctance to inject serum was largely due to exaggerated fears of anaphylaxis based upon the use of the older unconcentrated sera which were relatively rich in foreign proteins. Intravenous injection of massive therapeutic doses of concentrated serum even in potential sensitives very rarely gives trouble, and even when signs of anaphylaxis are observed injection of adrenaline, which should always be at hand, speedily clears them up. The injection prior to tonsillectomy of a combined prophylactic dose of diphtheria and scarlet fever antitoxins, with a view to the prevention of post-tonsillectomy diphtheria or scarlet fever, is now the practice at some of the London tonsil and adenoid clinics. Dr. Harries holds that the best procedure is to do preliminary Schick and Dick tests and inject only the specific antitoxin indicated by the results. For the carrier state he advocated rational surgical measures according to the type of nasopharyngeal abnormality discovered. True intermittency of the carrier state amongst convalescents was said to be rare, spurious intermittency, caused by contact reinfections in the ward, being frequent. It is desirable to nurse convalescent carriers in cubicles or in the open air. Indiscriminate swabbing for the detection of carriers in the community is now recognised as futile. For the control of outbreaks in institutions swabbing is a necessary procedure, but it must be combined with virulence tests and Schick tests in the way devised by Eagleton, Okell, and O'Brien.[1]

The control of measles by the use of convalescent or adult immune serum was discussed by Dr. William Gunn, followed by Dr. J. E. McCartney, who demonstrated the apparatus used for the collection of blood in the L.C.C. service. Both speakers stressed the value of convalescent serum either for temporary prevention or attenuation of the attack, and of adult immune serum for attenuation rather than prevention. It was pointed out that now, when an extensive epidemic of measles in London is terminating, is the time to collect large supplies of serum for use in the next epidemic. Dr. Gunn, while agreeing that parental whole blood was a reliable means of prophylaxis in the absence of serum, mentioned two objections which might be raised to its use: (1) the large amount—30 c.cm. as a minimum—which was necessary, and (2) the fact that the injection produces an artificial hæmatoma which takes some time to disappear. Discussing the hospitalisation of measles, Dr. Gunn insisted that in order to avoid

[1] THE LANCET, 1934, i., 800.

post-admission complications ample bed spacing is necessary, and that free use should be made of barrier nursing. Better still, he thought, children should be nursed in cubicles or small ward units containing not more than four cots, or on balconies or verandahs. He advocated ample provision for stay in convalescent hospitals when the acute stage was over. With regard to whooping-cough, no reliable advance in therapy seems yet to have been made, but in the experience of some workers abroad fresh vaccines suitably prepared and injected in sufficient dosage had given promising results in prophylaxis.

THE SURGEON AND THE GUNMAN

In discussing last week certain aspects of professional secrecy it was observed that the doctor's problems in this respect are by no means merely academic. Perhaps the most romantic of the situations about which the medical student is instructed is that of the hunted criminal who comes to physician or surgeon for treatment of his injuries. A classic example is now reported from America by the *Times* correspondent in New York. John Dillinger, the notorious gunman whom the forces of the law are seeking to apprehend, was apparently treated some weeks ago by Dr. Clayton May, a Minneapolis physician, for a gunshot wound. Did Dr. May inform the police? He did not. Consequently he was charged, together with Dillinger's sweetheart, before a Federal Court jury in St. Paul with the offence of conspiracy to harbour a criminal. Each of the accused was sentenced to undergo two years imprisonment and to pay a fine of 1000 dollars. A nurse who acted under Dr. May's directions was tried on the same charge and acquitted.

A country must protect itself against its public enemies; a doctor does not cease to be a citizen. For Dr. Clayton May, however, there was only one question. Did John Dillinger come to him for treatment trusting in his professional honour? The answer is obvious, and Dr. May's colleagues in every country will applaud his action in not betraying a professional trust.

INTENSIVE INSULIN AND GLUCOSE TREATMENT OF DIABETES

The conception of diabetes mellitus as a condition of pancreatic exhaustion is one which it becomes progressively harder to reconcile with all the facts. Prof. Arthur Ellis has lately described [1] a phenomenon which is difficult if not impossible to explain satisfactorily by this theory, and which may prove of no little importance in the understanding of the disease. In certain cases of diabetes under treatment wide variations occurred in the blood-sugar values, rendering them difficult to control, and it was thought that this might be due to depletion of the stores of hepatic glycogen. An attempt was accordingly made to remedy this by the hourly administration of glucose and insulin and somewhat surprising results were obtained. It was found first of all that very large amounts of carbohydrate could be dealt with in this way; and secondly, that there was a considerable temporary increase in carbohydrate tolerance. This was most striking in young subjects whose disease was of relatively short duration; in one case (that of a boy of ten) over 600 g. of glucose were given in the 24 hours, with 10 units of insulin hourly, and it was found not only that the boy became hypoglycæmic on this régime, but that a subsequent sugar-tolerance curve showed a fasting value of 0·054 and a rise to only 0·200 after 50 g. glucose. In another instance it was possible to reduce the insulin required to keep the patient sugar-free on a standard diet from 192 units daily before treatment to 9 units daily afterwards. Ellis reports eight cases treated in this way for a variable number of days, and in all but one a definite increase in carbohydrate tolerance took place during or after treatment. The improvement seemed to be progressive almost from the onset of treatment and to reach a maximum in about twelve days. Except in two cases (both of them early) the improvement was only temporary, but in none was there any evidence that the diabetic condition had been made ultimately worse. No further improvement occurred with a second course of intensive treatment which was given to two of the eight patients.

In considering his findings in relation to present theories of the pathology of diabetes, Prof. Ellis points out the difficulty of explaining the increased tolerance as due to an increased output of insulin by the patient on a high carbohydrate diet, since it is generally supposed that carbohydrate stimulates the output of insulin by raising the blood-sugar, whereas these patients tended rather to be hypoglycæmic during the period of treatment. Again, it is recognised that when small doses of insulin are given frequently, the glucose-equivalent of a unit is higher than when larger doses are given once or twice a day.[2] That this was not a complete explanation, however, was shown by control injections without glucose, after which the improvement was not comparable to that seen when glucose-insulin therapy was combined. Prof. Ellis's findings might be explained on the theory recently put forward by H. P. Himsworth [3] that insulin as secreted by the pancreas is an inactive material requiring activation by some unknown substance ("insulin kinase") produced by the liver. At present, however, there is no direct evidence that an increased activation of insulin occurred in these cases as a result of the intensive glucose-insulin therapy. Whatever the explanation of the increased carbohydrate tolerance may prove to be, it certainly seems to offer experimental support to the use of high carbohydrate diets in the treatment of diabetes.

ILLICIT TRAFFIC IN NARCOTIC DRUGS

Bulgaria has been suspected [4] of being the source of much of the illicit traffic in narcotics which has found its way into other countries of Europe and into Egypt. Quite recently some ten secret factories of morphine and heroin have been unmasked, mainly through the vigilance of T. W. Russell Pasha, director of the Central Narcotics Bureau and commandant of police at Cairo. Not only has the production of the opium poppy been greatly augmented during the past year, but it is alleged that not less than 3000 kg. of heroin have been manufactured in Bulgaria during the current year. Russell Pasha, in his annual report for 1933, states that the convicted addicts undergoing imprisonment in the State prisons of Egypt had fallen from 5681 in 1929 to 674 on Oct. 1st, 1933. He gives a list of 26 gangs of illicit traffickers in narcotics operating in Egypt which have "been tracked down and disposed of," and claims that the narcotic menace which threatened Egypt five years ago has been removed. Nevertheless, large quantities of illicit opium continue to be exported from Turkey, and the practice of eating opium is said to be spreading in

[1] Quart. Jour. Med., April, 1934, p. 137.

[2] See THE LANCET, 1931, ii., 752.
[3] Ibid., 1932, ii., 935, and Jour. of Physiol., 1934, lxxxi., 29.
[4] See THE LANCET, 1933, i., 811, and ii., 818.

the districts adjacent to Port Said and the Suez Canal. While the export of Syrian hashish has been checked, large quantities of Turkish hashish, which is richer in resin and aroma, are smuggled into Egypt. Although the Opium Advisory Committee and the Permanent Central Opium Board of the League of Nations have done much to expose and restrict the contraband traffic in narcotics, Bulgaria, and in the Far East, Manchuria, continue to be the producers of narcotics vastly in excess of the legitimate medical requirements of the whole world.

A MENTAL DEFICIENCY COLLECTION

THE library of the Royal College of Surgeons of England has recently acquired a collection of reports with full details and photographs of all the mentally deficient children—about 4000—admitted to the Fountain Hospital, Tooting-grove, under the Metropolitan Asylums Board from 1914 to 1927. These reports are classified and indexed, and are supplemented by a large series of published papers on mental deficiency from all parts of the world, regularly increased and kept up to date. The whole material is available for readers in the college library from 10 A.M. to 6 P.M. daily (Saturdays 10 A.M. to 1 P.M.), and the compiler and donor is willing to meet students by appointment. The librarian, it is stated, will be glad to have reprints of articles on mental deficiency or allied subjects for inclusion in the collection.

SUCCESS OF SPINAL ANALGESIA

Two papers lately published in widely distant cities bear testimony to the assured position which spinal anæsthesia has at last attained. One of them which has a special interest in connexion with the Royal Society of Medicine's debate on anæsthesia for urological surgery, reported in our issue of May 5th (p. 961), deals with spinal analgesia in the Bellevue urological service, New York, during the years 1925 to 1930 inclusive.[1] Local anæsthesia is the method of choice in this institution and operations which cannot be performed with infiltration are carried out whenever possible with spinal injection. The number of spinal injections reported on is 1490, of which 75 were for cystoscopies and the remainder for urological operations—on the prostate, kidney, and so on. The only fatalities were in persons almost moribund from sepsis and uræmia, and of these only two died in the operating theatre. Novocain was the agent used for all operations lasting not more than one hour; for the longer proceedings Nupercaine in 1 in 200 solution was employed. The patients receive morphia gr. ¼ before going to the operating theatre, and if the systolic pressure is found to be less than 100 mm. Hg, 50 mg. ephedrine hydrochloride intramuscularly; the spinal puncture is not made till the pressure has reached at least 100. The details given show excellent results from the technique adopted.

The other paper[2] comes from Sydney, New South Wales. The author has given over 2500 spinal injections for analgesia without a single death attributable to the anæsthetic. He is a strict follower of the technique originally introduced by Barker, but has reduced the diameter of Barker's instruments. He too employs ephedrine as a routine measure for preserving blood pressure and he uses Percaine in 1 in 200 solution in 6 per cent. solution of glucose. Not more than 2 c.cm. of this solution is needed, even when high analgesia is desired. He deprecates any form of preliminary medication and believes in securing the patient's mental quiet and intelligent coöperation by judicious conversation with him beforehand. Strict attention is given to the patient's posture just after injection, and this is shown in illustrations.

[1] Howley, T. F., and Robertson, J. P.: Amer. Jour. Surg., April, 1934, p. 129.
[2] Silverton, R. J.: Austral. and N.Z. Jour. Surg., Jan. 1934, p. 223.

THE HOSPITALS YEAR-BOOK, 1934

THE Central Bureau of Hospital Information had no easy task before it when it took over the publication of "Burdett." We have now before us the fourth issue of its successor, "The Hospitals Year-Book," the object of which, in Sir Arthur Stanley's words, is to help all engaged in the administration of medical charities to compare notes and by the interchange of experience to promote economy and secure uniformity. The information required for this purpose can be obtained only by the willing coöperation of the hospitals themselves, and whereas for the most part this has been freely given in the spirit in which it was asked for, in other cases urgent entreaties failed to elicit the information. The difficulties have resulted in the delay of the Year-Book to a date nearly eighteen months after the end of the financial year to which it refers. It is a pity that this is so, for the Central Bureau is in a position to inquire into many of the problems that must interest all hospital administrators. What is the optimum size of a hospital? What is the ratio of nurses to patients? What is the productivity of this or that form of raising money? What expenditure will this or that system of heating and lighting involve? These and other questions are put by the Bureau for the clear and definite purpose of providing material with which to help administrators to carry out their work more effectively. We are happy to add our word to the appeal of the editor, Mr. R. H. P. Orde, B.A.—who is also hon. secretary of the British Hospitals Association—to the voluntary hospitals both in Great Britain and Ireland to coöperate as promptly and as fully as they can with the work of the Central Bureau. Nothing has done more to retain the support and confidence of the public in the voluntary system than the work of the associations represented at 12, Grosvenor-crescent, S.W. 1.

ON Tuesday next, at 5 P.M., Prof. O. L. V. S. de Wesselow will give the first of his Croonian lectures before the Royal College of Physicians of London. The subject will be arterial hypertension, and the following two lectures will be delivered at the same hour on June 7th and 12th.

THE eighth annual Macalister lecture will be delivered at the National Temperance Hospital on June 21st at 9 P.M. by Dr. Robert Hutchison. The subject is Praise and Dispraise of Doctors. The lecture is free to medical practitioners and to their friends of either sex.

THE series of articles on Prognosis contributed by invitation will be resumed on June 16th, when Dr. Reginald Miller will write on the Prognosis in Juvenile Rheumatism.

Sir Gowland Hopkins, P.R.S., will take the chair at a meeting arranged by the Committee against Malnutrition for Wednesday, June 13th. As announced in our last issue, this meeting is called to discuss the steps to be taken in combating "the widespread undernourishment of men, women, and children," and the speakers will include Dr. R. D. Lawrence, Dr. R. A. Lyster, Dr. Stella Churchill, and Prof. J. B. S. Haldane. It will be held at 8 P.M. at 34, Red Lion-square, W.C., and tickets may be had from the hon. secretary of the committee, Mr. F. Le Gros Clark, at 19C, Eagle-street, W.C.1.

THE PREVENTIVE ASPECTS OF MEDICINE

A Series of Lectures in progress at King's College Hospital Medical School

XXIV.—PRINCIPLES OF IMMUNISATION AND PREVENTIVE DISEASE

THE general principles of prophylactic immunisation may seem to come a little intrusively into a course of lectures that has dealt, in the main, with practice rather than with theory; but there have been many references to the application of the mechanisms concerned in specific immunity, and something is certainly to be gained by getting a clear picture of the way in which these mechanisms act. With such a picture in our minds we are, at least, more likely to use our instruments intelligently, and therefore successfully, and less likely to expect them to work under entirely inappropriate conditions.

If the picture is to be useful as a working diagram it must be clear; and if it is to be clear it must be sketchy. It must, indeed, depart in places from any strict canon of scientific accuracy; for this would demand that outlines should often be blurred, and shaded with provisos and exceptions, whereas we want them hard and clear. We must, then, for our present purpose, adopt the method of didactic simplification, adopting some theories as facts and ignoring awkward exceptions to rules. This will not matter so long as we are frank about it, taking our picture as a provisional working plan, subject to alteration if and when modifications become necessary. For the same reason it will be convenient to assume an almost blank ignorance of the mechanisms with which we are concerned, since once we begin to leave things out because they seem too simple and elementary it is difficult to know where to stop. Again, it will simplify matters if we omit all reference to authorities, and leave our summary of facts and theories undocumented.

Mechanisms of Antibacterial and Antitoxic Immunity

The mechanisms with which we have to deal are, in their essence, very simple. When certain foreign substances—substances to which we give the generic name of *antigens*, and which include bacteria, viruses, and toxins—gain access to the tissues, they stimulate the production of a particular kind of serum protein that is known as an *antibody*. The essential quality of an antibody is the presence of a specific chemical group, or arrangement of groups, that enables it to combine with the antigen, and, in so doing, to alter its physical and chemical properties.

The body makes use of this mechanism, which was probably developed in the first place for quite different ends, in protecting itself from infective disease. The antibodies that are formed when bacteria, or viruses, or their products, gain access to the tissues react specifically with them, rendering them relatively or wholly innocuous.

In the case of a toxin the result of the antigen-antibody union is neutralisation—neutralisation in the immunological sense, for there is little evidence that the toxic chemical grouping is itself destroyed or chemically changed. This neutralisation is accompanied by the flocculation of the toxin-antitoxin compound. It may be, though it is at present no more than a guess, that the innocuousness of this compound depends on its low diffusibility.

In the case of bacteria, or virus particles, the antigen-antibody union occurs on the surface of the parasite and results in the deposition thereon of scattered or continuous patches of antibody globulin. This change in the nature of the bacterial surface has important secondary results. The bacteria tend to adhere together, they are more easily ingested by phagocytic cells, and, in some cases, they become sensitive to a serum constituent known as complement, which produces a type of disintegration known as lysis. As a consequence, bacteria or viruses that would, in their unaltered state, become widely dispersed throughout the tissues and multiply freely in them are, when sensitised by a specific antibody, retained and held in check either in the immediate neighbourhood of their portal of entry, or in specialised tissue areas such as the lymph glands, the spleen, the liver, the bone-marrow, and so on, that contain depôts of active phagocytes of the reticulo-endothelial type.

But though we should always keep antitoxic and antibacterial immunity distinct in our minds, and can sometimes separate them in practice, we are often concerned with infective diseases that have both toxæmic and invasive characters. In such cases we may be able to alter the disease syndrome, by eliminating the toxæmic element, even though we fail to prevent those pathogenic activities of the parasite that depend on tissue invasion.

The differentiation between toxæmic and invasive effects suggested by such statements as these is, however, over precise, useful though it is for purposes of description and argument. Bacterial invasion would do no harm if the bacteria were not in some way toxic in themselves, and we must suppose that they injure the host's tissues by a variety of mechanisms which must, in the final analysis, be of a chemical nature. The real differentiation is between the immunity that can be developed to particular toxins that are freely liberated from the bacterial cells and diffuse widely throughout the tissues and the immunity that depends on limiting the dispersion and activities of the bacterial cells themselves, with all the other toxic mechanisms that they have at their disposal.

We may note that antibacterial immunity, in part because it depends on the interaction of many factors of which immunisation affects only one, in part because the living bacterium has methods of counter-attack that a non-living toxin has not, tends to be less consistently effective than the antitoxic form. Antiviral immunity, which is determined by the same general factors as the antibacterial type, though perhaps with minor modifications, is often conspicuously effective.

Methods of Exploiting Specific Immunisation

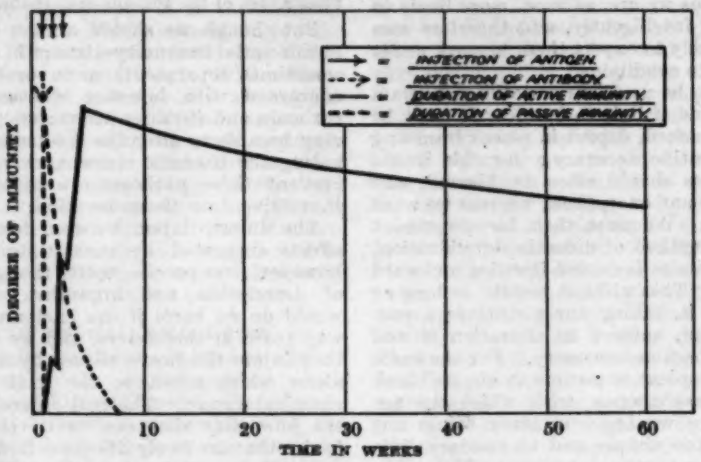
Before passing to the essential problem of specificity, which determines among other things the differentiation between antitoxic and antibacterial immunity that has been referred to above, we may consider in very general terms the ways in which we may exploit the mechanisms that we have outlined, limiting ourselves to prevention, and leaving the treatment of established infections out of account.

The thing we have to do is to provide a person with an adequate supply of the required antibody, or antibodies, and we can do it in two ways. We can make him make his own, by injecting the appropriate antigen. That is active immunisation. Or we can use some conveniently large animal, such as the horse, as an antibody factory, injecting into it the antigen with which we are concerned, and we can then provide the person to be immunised with the necessary antibodies ready-made by injecting into him the serum proteins of the previously immunised horse. That is passive immunisation.

Our choice of method is determined by the time relations of these two procedures. Active immunisation takes time. One dose of antigen may have little effect. If it does it will be several days at least, and sometimes weeks, before any effective immunity is induced. More often at least two injections are needed, at about a week's interval; and there is again a further interval before effective resistance is established. This, for instance, would seem to be the case in prophylactic vaccination against typhoid fever. Sometimes three, or four, or more inoculations are required before the desired result is attained, as, for instance, in the immunisation of certain persons against scarlatinal toxin.

To set against this relatively slow induction of active immunity there is the fact that such immunity, once induced, is relatively lasting. Our information as to how long it lasts is, in fact, much less precise than many written and spoken statements would lead one to suppose. But it certainly lasts for months in most cases, often for some years, and it may be for a decade or more. Its relatively long duration depends in part on the fact that the antibody in this case consists of a modified type of the person's own serum protein, and as such is probably not eliminated from the blood and body fluids at a rate greater than the normal turnover of serum proteins, whatever that rate may be. In greater part it rests on the fact that the formation of antibody outlasts the stimulus provided by the injection of the antigen, as may be shown by bleeding an immunised animal extensively and finding that the serum proteins, formed to make good the loss, contain a proportion of antibody little if any lower than before the bleeding. In greatest part, perhaps, it depends on the fact that in the actively immunised person a habit of rapid response to a particular antigenic stimulus has been established, so that any subsequent entry of that antigen into the tissues, as in an incipient infection, is followed by a prompt and vigorous production of antibody.

FIG. 1



The time relations of passive immunity are very different. The full protective effect of the injected antibody is established at once, but this effect is relatively transient. The antibody is usually a foreign protein. As such it is eliminated from the blood and tissue fluids more rapidly—in some sensitive persons much more rapidly—than the autogenous antibody proteins formed in active immunisation. Moreover the total amount of antibody available is limited to the amount injected. No more is formed, nor does the passively immunised person respond with any increased briskness to any subsequent entry of antigen into the tissues. The duration of effective passive immunity is, indeed, an affair of weeks, and usually of a few weeks. Fig. 1 shows approximately the time relations of the two types of reaction, the height of each curve corresponding to the degree of immunity existing at any given time period, and the times of injection of antigen or antibody being indicated by arrows.

The practical implications are obvious. We shall use the method of active immunisation whenever the persons to be immunised are likely to be exposed to risk over a long period, and when the immediate risk is not so great that the delay of a few days or weeks in the induction of immunity is a serious factor.

Thus we use this method in vaccination against small-pox, in infancy or at later ages, in antityphoid vaccination designed to protect troops or others proceeding to areas where this disease is frequent, in mass immunisation against diphtheria and so on. We use it, too, in some cases in which the risk is an immediate one, or in which it has already been incurred, since experience has shown that, under certain conditions, the advantage of durability outweighs the slight delay in induction. Thus, when an outbreak of diphtheria starts in a boarding school, or in a similar institution, the susceptible, Schick-positive children must be regarded as having been exposed to risk at the time the first case is diagnosed. We could protect them passively with antitoxin, but this would leave them susceptible to subsequent infection. It is generally regarded as better practice to induce an active immunity in all susceptibles, controlling this procedure by the examination of throat swabs, and promptly administering antitoxin to any susceptible child found to be carrying virulent diphtheria bacilli and showing any clinical signs of infection. Similarly, experience has shown quite clearly that a small-pox epidemic may be successfully circumscribed by the immediate vaccination or revaccination of all contacts, followed by a general vaccination campaign in the locality. It would seem that in this type of prophylactic vaccination, in which a living virus is employed, the induction of immunity is sufficiently rapid to prevent or modify the clinical infection, even when exposure has already occurred.

The use of passive prophylactic immunisation will be limited to those instances in which we are concerned with a specific risk of infection, occurring at a known time and unlikely to continue, or to be repeated, once this particular period has passed.

A good example is the use of passive prophylactic immunisation in tetanus. A man suffering from a severe and badly soiled wound, incurred in warfare or in any of the major accidents of civil life, runs a risk of contracting this disease. The administration of tetanus antitoxin, repeated at weekly or ten-day intervals for a few weeks, obviates or greatly reduces this risk, and since the risk is certainly not continuous, and, if unfortunately repeated, can, with certain limitations, be dealt with in the same way, the fact that immunity is of short duration does not matter. Sometimes we use this method in prophylaxis against diphtheria, as when a case of this disease accidentally gains admission to the children's ward of a general hospital, and it is more important to prevent the immediate spread of infection to other sick and susceptible children than to secure for them a more lasting immunity. In the case of scarlet fever this method of controlling a ward epidemic by passive immunisation is still more clearly indicated, because active immunisation is here a longer and less certain process.

Perhaps one of the best examples of the successful exploitation of passive prophylactic immunisation is the success that has been achieved by the use of convalescent or adult human serum in measles. By this means, provided that an adequate dose is given during the first five or six days after exposure to infection, it is possible in the great majority of cases to prevent the development of the disease. But, though the attack is prevented, the child

becomes fully susceptible again after a few weeks; and, since future exposure to risk is almost a certainty, the procedure is often modified, except in the case of very young or sickly children, by giving a smaller dose of serum at a rather later date. The usual result of this procedure is that a clinically trivial attack of the disease develops and that the child is endowed with a lasting immunity to reinfection. The method affords a good example of mixed active and passive immunisation.

Specificity of Active and Passive Immunity

And now, after this brief sketch of the mechanisms concerned and the ways in which we exploit them, we may turn to a factor that is central to our whole problem, and which, for that reason, demands rather more detailed consideration. If this part of our discussion seems, in some aspects, a trifle academic, it is at least severely practical in its implications.

The harmful agents with which we are here concerned are bacteria, or viruses, or their products. The important thing about them from our present point of view is their size—not their smallness, but their bigness. We are dealing with cells, or particles, or molecules, that vary in diameter over some such range as 2μ to 0·004μ, if we regard them as spheres, or over a comparable range if we allow for departures from the spherical form. If, to avoid unnecessary decimals, we express size in terms of Angstrom units, these figures become 20,000 Å to 40 Å. However small these may be in relation to the visual power of the human eye, they are big things as looked at by an atom, or by any small group of atoms. The carbon atom, for instance, has a diameter of about 1·5 Å. There is room for many different chemical groupings on the surface of the smallest particle with which we have to deal, room for still more on the smallest virus, and for a vast number on an average-sized bacterium.

We must think of the surfaces of these particles, viruses, or bacteria, not as smooth and homogeneous, but as irregular, patchy, and studded with projecting chemical groupings, and it is the nature and arrangement of these groupings that determine all the reactions with which we are here concerned. Perhaps a fair simile would be an island with irregularly dispersed patches of a varied and rather formal vegetation. But it would be a spheroidal or cylindrical island, with the patches of vegetation all over it; and we should think of it as totally submerged, because, in all the reactions with which we are concerned, our particles or bacteria are suspended in a watery fluid. The sea-bottom on a pebbly or rocky shore, where there are numerous attachments for marine growths, is, perhaps, not a bad image of part of a bacterial surface.

The two objects in Fig. 2 afford very crude and imperfect models of the kind of surface that we must keep in our mind. Let us, for convenience of reference, call the left one A and the right one B. They are definitely misleading in regard to the relative size of the cells and of the active chemical groupings that they bear. If we wished to preserve anything approaching due proportion, we should have to regard them as molecules of some bacterial product, rather than as intact bacteria or viruses. To represent to scale an entire bacterial surface with active chemical groupings of a similar size would entail making a model several feet in diameter, but our smaller models will serve our purpose, so long as we remember that they are grossly out of scale. Those who are familiar with the modern concepts of structural organic chemistry will be able to construct far more adequate images for themselves. Those who are not, but would like to be, will find in a recent monograph by Dr. J. R. Marrack an admirable summary of the essential data.

There are various chemical groupings represented on the surface of these bacteria; but some of them have been given special prominence. We will suppose that these prominent groupings have a dominant rôle in determining the physical and chemical characters of the surface, and that it is the union of antibody protein with these groupings that sensitises the bacteria and renders them susceptible to the defence mechanisms that we have described above. In order that this union may occur the antibody protein must carry groupings having a chemical affinity to those present on the bacterial surface, and it is probable that the spatial arrangements of the active groupings on the large antibody molecule, as well as their individual nature, plays a significant part; since if the pattern of these groupings on the antibody is the same as the pattern on the antigen the surfaces will fit neatly together, with the corresponding groups in apposition, while if the pattern is widely different the fit will be a bad one. In any event, the relation between antigen and antibody is strictly specific, as specificity is understood by the organic chemist; and an antibody that will effectively sensitise organism A will have no effect on organism B. In Fig. 3, A and B are supposed to have been immersed in an antiserum prepared by immunising an animal against A. Antibody protein has been deposited on the specific antigenic groupings that dominate A's surface; but the surface of B remains unaltered. If A gained entry to the tissues of a person endowed with this antibody in adequate amount it would be arrested at or near its site of entry. If B gained entry to the same person's tissues it would multiply and give rise to a widespread infection.

Practical Limitations Imposed by Specificity

We cannot immunise a person against organism A by injecting organism B, nor against B by injecting A. We must keep this essential point clear in our minds. We must not, as immunologists, think in terms of diseases, of enteric fever, or pneumonia, or colds in the head, nor even, as we shall see, in terms of bacterial species, of pneumococci, or hæmolytic streptococci, or staphylococci, we must think in terms of antigenic groups and patterns. But the clinician or the medical officer of health does not want to immunise against an antigenic group or pattern. He wants, quite rightly, to prevent enteric fever, or pneumonia, or colds in the head; so that, for practical purposes, we must take the problem as he looks at it, and see how it looks to us in the light of our own immunological data.

The answers we get are simple and definite enough, though some of them may be disappointing. When we are reasonably sure that a particular disease is caused by one, and only one, bacterial species, and that bacterial species contains one, and only one, antigenic type, then immunisation against that antigenic type should be equivalent to immunisation against the disease. But where a given disease is caused by bacteria of different antigenic types—whether these types differ in other ways so that they are regarded as different bacterial species, as in the bacilli of the typhoid-paratyphoid group, or whether they are classified as different types within the same species, as in the different types of pneumococci—then immunisation against any one type is not equivalent to immunisation against the disease, and its relative effectiveness or ineffectiveness will depend on the relative importance of that particular antigenic type in the causation of the disease. If, for instance, the disease were caused by not more than two or three antigenic types we might, by the injection of one of them, produce an appreciable reduction in the incidence of the disease as a whole. What, of course,

we actually do, is to try to include in our vaccine all those types to which a person is likely to be exposed. If these number only two or three the problem is easy, but where the number of types is very large we can hardly hope to obtain the same result, partly because there is a limit to the number of different types that can be effectively combined in a vaccine, partly because the relative importance of different types may vary from place to place and from time to time.

Specificity in Relation to Antitoxic and Antibacterial Immunity

It will be noted that, in our discussion of immunological specificity, we have so far confined our attention to antibacterial immunity. What happens when we bring antitoxic immunity into the picture?

Fig. 4 shows our same two antigenic types of bacteria, but we will now suppose that they are of the kind that produce a soluble toxin that passes freely from the bacterial cells to the body fluids, and we will represent this toxin by smaller particles bearing antigenic groups that are the same for each particle of toxin, but different from the antigenic groups on A or B. We have chosen to suppose that the two antigenically different bacteria produce the same kind of toxin, and this is a useful supposition because it corresponds to what actually occurs with such an important toxin-producer as the diphtheria bacillus, of which there are many different antigenic types, all producing the same toxin. The same is true of the tetanus bacillus, and, as we shall see, of hæmolytic streptococci. It may, indeed, so far as our present knowledge goes, be regarded as the usual state of affairs.

Suppose that these organisms and the toxins they produce are brought into contact with a serum containing antitoxin but no antibodies acting on the bacteria themselves. Antibody protein will unite with the particles or molecules of toxin, as in Fig. 5, but the bacteria will not be affected. If the bacteria are of the kind that have little invasive power, as is the case with the diphtheria bacillus, then a person possessing this antitoxic antibody will be effectively immune to the clinical disease because, although the diphtheria bacilli that gain access to his throat will not be interfered with, any toxin that they produce will at once be neutralised.

Let us now suppose that our organisms are not diphtheria bacilli, but some organism that has invasive as well as toxigenic powers—say, for instance, two antigenic types of hæmolytic streptococci. We shall, by inducing an effective antitoxic immunity, change the disease without necessarily preventing it, since we shall eliminate only one part of the total clinical syndrome. If we take as an instance scarlet fever, we shall approximate to prevention in the clinical sense, because the erythrogenic toxin is responsible for so much of the classical syndrome of the disease, including the characteristic rash, that what remains would hardly be included in the same clinical category. We shall, however, be left with cases of tonsillitis, sometimes complicated with otitis, that would have been regarded as scarlet fever if the rash and certain other lesions had not been suppressed.

If, however, the type of infection is one in which the invasive activity of the organism is far more important than its toxigenic action, then we should expect little success from antitoxic immunisation.

It is customary, in antitoxic immunisation against such diseases as diphtheria and scarlet fever, to use as our immunising agent a culture filtrate that contains the toxin but not the bacterial bodies. In the case

FIG. 3

FIG. 3

of diphtheria we treat this toxic filtrate to make the toxin harmless, though still antigenic. In the case of the erythrogenic toxin of the hæmolytic streptococcus we usually employ the unaltered toxin, because, in suitable graded doses, it produces no serious toxic effects. In neither case do we make any attempt to induce an antibacterial immunity. We could do so, by injecting bacterial cells as well as their soluble toxin, but it would be of little avail, because we should be frustrated in our attempt to add an antibacterial to our antitoxic immunity by the multiplicity of antigenic types.

Suppose that, in order to protect against the invasive as well as the toxigenic effects of the hæmolytic streptococcus, we injected bacterial cells as well as toxin, using a streptococcus of the A type, Fig. 6 indicates the kind of result that we should obtain. If the person immunised were exposed to infection with a streptococcus of Type A all would be well. The toxin would be neutralised and the streptococci sensitised. But if the streptococcus were of Type B, or of any other type except A, there would be no protection against its invasive action; and, since the different antigenic types of pathogenic hæmolytic streptococci are in fact very numerous, there seems no immediate hope of inducing an effective antibacterial immunity against the various infections to which they give rise.

The Concord between Expectation and Experience

So far we have been considering our practical problems in the light of our immunological data, and we have been concerned with one particular type of mechanism, and with that only. We have no right to assume a priori that it is the only mechanism at work, and we must be prepared to reconsider our working hypothesis, if the results obtained in properly controlled trials carried out in the world outside our laboratories are not in accord with our expectations.

We may, therefore, usefully conclude our discussion

by a brief reference to a few of the instances in which the available records allow us to test our conclusions in this way. Some of the relevant evidence has been referred to already, for illustrative purposes, but repetition is often difficult to avoid, and is occasionally excusable.

Vaccination against *small-pox* is one of the oldest and perhaps the most successful form of prophylactic immunisation. The antigenic material employed is living vaccina virus. Recent studies have demonstrated quite clearly that vaccinia virus and variola virus are antigenically identical. Vaccination provides a striking example of effective immunisation against a disease that is caused by a single antigenic type of micro-organism.

Enteric fever is a clinical designation for a group of infections caused by the typhoid and paratyphoid bacilli. Since the typhoid bacillus plays a major part in most countries, we should expect the use of an antityphoid vaccine to lead to a significant reduction in the number of enteric infections, and this has proved to be the case. But we should not expect it to prevent infection with the paratyphoid bacilli A, B, and C, and experience in the war showed that it does not. These three types, together with the typhoid bacillus itself, account for the vast majority of enteric infections. In Western Europe the C type is infrequent. By including the A and B types in our vaccine, in addition to the typhoid bacillus, we should expect to obtain a very considerable reduction in the frequency of enteric infection. Experience in the war indicated that this reduction is, in fact, obtained. Enteric fever affords a good example of a disease in which effective immunisation is possible because the causal agents, although they are antigenically different, are few in number.

Lobar pneumonia is caused by a wide variety of different antigenic types of pneumococci. The best that we could expect from prophylactic vaccination would be a reduction in frequency commensurate with the elimination of infection due to the types included in our vaccine, and since the types are many and vary in their relative frequency from place to place and from time to time, our expectations would not run high. In fact, the history of prophylactic immunisation against lobar pneumonia has been a chequered and, on the whole, unhappy one. We might take it as an illustration of failure in the face of a multiplicity of antigenic types; but fairness compels the proviso that the records suggest that some part of the failure at least may be due to a relative ineffectiveness of antibacterial immunisation against this disease, even when the immunological requirements are fulfilled.

We have noted already that *diphtheria* affords an excellent example of the effectiveness of antitoxic immunity, unassociated with antibacterial immunity, as a protection against an infection that is almost wholly toxæmic, and that *scarlet fever and allied conditions* illustrate the modifying effects of an antitoxic immunity on infections that are in part toxæmic, in part invasive. We may, perhaps, expand our picture of immunity to hæmolytic streptococci by noting that the clinical records indicate quite clearly that an antitoxic immunity affords no significant protection against such a typically invasive disease as *puerperal septicæmia*.

FIG. 4

FIG. 5

FIG. 6

In general it is true to say that where the basic principles of specific immunisation have been followed a very considerable degree of success has been achieved, and that the failures or partial failures have been encountered where we should have expected to find them. But these basic principles have not always been followed. They are not always followed to-day. The results that are obtained when they are neglected are a most useful control to the results that are obtained when they are observed.

One of the most important of our minor infective diseases is the *common cold*.

Its causation must still be regarded as an unsolved problem, though there is a growing body of evidence in favour of the view that the primary causative agent in the acute infectious type of cold that spreads readily from one person to another is a filtrable virus. This evidence, and many other observations relating to the normal bacterial flora of the nose, throat and nasopharynx, tell strongly against the view that the acute infectious cold is caused by pneumococci, influenza bacilli, hæmolytic streptococci, Gram-negative diplococci, or any of the other potential pathogens that are commonly found in these situations. This does not mean that these bacteria play no part in the total syndrome of the common cold as it frequently develops. They are quite certainly concerned in the suppurative infections of the nasal passages and sinuses that are such common complications. But the pneumococcus, the influenza bacillus, and the hæmolytic streptococcus are all antigenically heterogeneous species. There are at least 32 types of pneumococci, probably as many, if not more, types of hæmolytic streptococci, and an unknown but certainly large number of types of influenza bacilli. There is no evidence that the strains of any one of these three organisms

associated, probably as secondary invaders, with the common cold are confined to a few serological types; all the available evidence is to the contrary.

What is the probable result of inoculating a person with a mixed bacterial vaccine containing a few types of pneumococci, some hæmolytic streptococci and influenza bacilli, and perhaps an assortment of other organisms? If, as seems probable, the common cold is a virus disease, then we shall clearly not protect against the primary infection. Shall we lessen the frequency of concomitant bacterial infections? It does not seem likely. We know very little in regard to the power of bacterial vaccines to afford protection against antigenically similar organisms when these organisms are acting as local secondary invaders in association with a filtrable virus, and what little we do know is not very hopeful. Even if it were, our expectations would be small; for there is no reason to suppose that the particular pneumococci, influenza bacilli, or hæmolytic streptococci that are present on, or gain access to, the nasopharyngeal mucosa of the vaccinated sufferer from the common cold will be antigenically similar to those included in the vaccine.

In conformity with our expectations, we find that in almost any instance in which a practical trial has been made of this method on an adequate scale and with proper controls it has been a clear and conspicuous failure.

Influenza falls into the same category. It is probably another virus disease. When we have obtained the virus in a manageable form—or the viruses if more than one antigenic type is concerned—we shall probably be able to protect successfully against influenza; and when we can do that we shall have conquered one of the major pestilences of our time. But, though the primary cause of influenza be a virus, there can be no doubt at all that the influenza bacillus plays a very important part as a concomitant bacterial invader; sometimes, at least, pneumococci and hæmolytic streptococci may play a similar or accessory rôle. What is the likelihood that a vaccine composed of influenza bacilli, or of influenza bacilli and pneumococci and hæmolytic streptococci, will prevent influenza, or significantly lower the frequency of the associated bacterial infections? The answer is clearly the same as that at which we arrived in regard to the common cold; and here again large-scale trials, carried out under properly controlled conditions, have amply confirmed that answer.

The results of experience—the negative as well as the positive ones—thus give us some confidence that, in applying the principles of specific immunity, so far as we know them, to the problems of practical prophylaxis, we are on the right lines. If so the future is not unhopeful. We are still very ignorant. In only a few instances do we yet know which bacterial antigen, of the many that are always present, plays a dominant rôle in the immunising process. Even in these cases we do not know whether other antigens, which alone may be quite ineffective, play a significant accessory part. It is probable that the crude bacterial suspensions we now employ are very imperfect reagents. The problem of improving them is a problem in applied chemistry. When it is solved we may be in a much better position than we are to-day to control those infective diseases that have failed to yield to other methods of preventive medicine.

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PANEL AND CONTRACT PRACTICE

INCAPACITY FOR WORK

AT its meeting on May 24th, the Medico-Legal Society discussed the nature of incapacity for work within the meaning of the National Health Insurance Acts. Mr. W. J. FOSTER, assistant secretary to the Prudential Assurance Co., said that under the 1924 Act an insured person was entitled to sickness or disablement benefit if he was rendered incapable of work by some specific disease or by bodily or mental disablement. The Act was not helpful in defining incapacity. The question was begged by talk about incapacity being due to such disease or disablement, but a certain amount of case law had arisen in the form of decisions given by referees appointed by the Ministry of Health. A member of an approved society was bound by the rules of his society; if the interpretation of these rules was disputed he had the right of appeal to the Ministry. The Minister then appointed either a barrister or a solicitor, associated with a medical assessor when expert medical knowledge was required. In the case of a woman appellant the medical assessor must be a woman doctor unless the appellant's own doctor was of her sex.

In the phrase "rendered incapable of work," what, Mr. Foster asked, actually is the meaning of the word "rendered"? Take a man who had had an accident for which he was receiving compensation; subsequently another incapacity supervened in the form of illness. His compensation pay is greater than his sick pay but when payment for compensation ceases can he then be said to be "rendered" incapable by the supervening illness? A decision has been given that a man cannot be "rendered" incapable if at the time of the commencement of the supervening illness he was already incapacitated. Total incapacity was required by the Act. In compensation cases a man may be totally or partially disabled but in health insurance a partial incapacity did not entitle to benefit.

In the old days to excuse a man from attending (say) a jury it had to be proved that he was "in bed with his boots off" and four knights were sent to his house to satisfy the court that this was so; they would report that he was "unbuckled, unbooted and ungirt." This process of proving incapacity was not possible to-day. They had to use common sense in deciding capacity to work. The work was supposed to be remunerative and suitable to the capacity of the worker. It need not necessarily be the worker's normal occupation. A miner with rheumatism and lumbago might be quite incapable of ever hewing coal again but able to do some light work. Disablement benefit which follows 26 weeks of sickness benefit must not be regarded as an old age pension. It was necessary to take into account the man's previous training, his aptitude for work, the availability of work—although slackness of work in the labour market could not be taken into account in deciding whether incapacity existed. It was the duty of an insured person to try to make himself capable by training and a decision had been given on this matter in the case of a blind man who was offered training for quite a long period (three or four years) but who by refusing to be trained lost his appeal against the society which had stopped his disablement pay.

After 26 weeks of sickness benefit the question of alternative employment will come up for consideration. This may be considered before or it may be taken later, but it is not the duty of the medical man attending the case. Here the society has to use common sense in dealing with individual cases. An illiterate labourer cannot be expected to take up clerical work.

COMPENSATION OR HEALTH INSURANCE

Compensation cases, said Mr. Foster, at times give rise to difficulty under the Act. A judge had defined total incapacity as the condition of a man in which a physical defect made his labour unsaleable, and a partial incapacity made his labour sell for less than normal. There was no parallel under the N.H.I.

Acts. A charwoman dislocated her shoulder at work. The dislocation was never reduced and although she had no loss of power in the forearm she could not scrub owing to the shoulder trouble. She was found to be partially disabled *qua* compensation but she had to find alternative occupation. In pregnancy the particular circumstances of each case had to be considered. A normal pregnancy might give rise to incapacity but in arriving at a decision no consideration could be given to rules of employers nor to æsthetic appearance. The welfare of the unborn child was irrelevant. The woman's occupation was important. There was the case of a married private secretary who claimed benefit for a normal pregnancy; but she lost. Hardship undoubtedly occurs when women are dismissed from their employment. Often on marriage women give up their normal occupation and take on the ordinary duties of a housewife. Can this be called remunerative occupation? The husband would have to pay someone to do the work if the wife did not do it. This was sometimes disputed but in reply to a recent question in the House of Commons the Minister of Health had agreed that housework could be considered as remunerative work. Difficulty arose where incapacity for a short period was frequent as in asthma, menorrhagia or epilepsy. Such patients cannot keep their work. In cases of epilepsy one has to consider the nature of the fits, their effect on the person and his mentality, but the difficulty of obtaining employment through the possibility of incapacity was not to be considered when deciding capacity to work.

Mr. Foster finally dealt with the subtle distinction made by the House of Lords between incapacity *to* work and incapacity *for* work. A workman with a useless eye whose condition was not noticed sustained an accident to his bad eye so that the condition became apparent through the removal of that eye. It was held that his capacity *to* work was the same as it was before when he had worked with the other eye only, but that his capacity *for* work was now nil because no one would employ him with one eye. He was awarded total compensation. Actually the wording of the N.H.I. Act was incapable "of," a phrasing not quite so wide in its meaning.

THE MEDICAL CRITERION

Dr. R. GODWIN CHASE, a member of the London Insurance Committee, said he thought the chief criterion a medical man had to use in deciding incapacity for work was whether the patient would be harmed by doing that work. Patients might describe terrible pains which they felt about joints in which full movement could be obtained. Practitioners sometimes failed to take into consideration the question of travelling involved in return to work. Pregnancy cases were really difficult; amongst 20,000 certifying doctors each would have his or her own view as to whether a woman should work in the latter stages of pregnancy. Experts were not agreed. Even the Ministry of Health spoke with two voices. While memoranda issued from the health insurance department implied that uncomplicated pregnancy was no bar to work, other memoranda from the infant welfare department advised quite long periods of rest before confinement took place. Patients talked to each other about these certificates and the conscientious doctor might lose patients through acting in the strictly legal manner. Certification in infective diseases was also difficult. A waitress with a septic rash on her face would not be allowed by her employers to work, although she was capable within the meaning of the Act. The same applied to scabies. Patients thought they were harshly treated if a certificate of incapacity was refused; they could, however, be given a letter to say that, whilst they were not incapable within the meaning of the Act, yet it was highly undesirable for them to work owing to the infective condition present.

Dr. W. DUNCAN, senior medical officer, General Practitioner Service, Ministry of Health, said that only a few doctors had any legal training, and it was a marvel to him that so few mistakes were made by the 20,000 doctors in insurance practice. Some of them took the view that their duty was solely to treat the patient and to get him better; they should not be bothered with certificates, that was the approved societies' work. But they would not let laymen decide whether incapacity was present and would not like a strange doctor to visit their cases solely to give certificates. A possible difficulty arose from the attendance required at hospital or clinic at some particular time which might reveal to an employer the fact that an insured person was ill, and in (say) a case of venereal disease might lead to dismissal from work. He thought some societies had funds from which as an additional benefit they could pay for the cases of infective diseases mentioned. Some married women in class K, reading that they were able to have six weeks benefit before they went out of insurance, interpreted that to mean that they were to have it and would approach the doctor with the statement, "I want my six weeks benefit."

A SUGGESTED SOLUTION

Dr. R. E. CROSSE thought it would be better if the medical side could be separated from the administrative side of the work. Doctors would then look after the medical problems, leaving administrators to deal with such difficulties as whether the insured person was entitled to benefit, and the relation of work to environment and availability. The word incapable should not be used in certification and the doctor should simply be asked to say whether a person was fit to work. He would divide patients into three classes: (1) those temporarily unfit for their work, (2) those permanently unfit for their work but not unfit for some other work, (3) those unfit for anything. He had tried to get this adopted some years previously but it was then thought that insured persons in small approved societies would suffer if it were adopted.

Mr. H. LESSER said the Act was administered by approved societies who inherited the old friendly society spirit and worked quite smoothly. Only fine points involving important principles were decided by referees. For example, a society was able to show that a blind man in receipt of disablement benefit received betting slips for a bookmaker in a public house, being taken there by a small boy. They could not prove he was paid for this but they said it was normally a remunerative occupation and on appeal the society won, thus establishing the principle of no benefit if working. It was always difficult to say at what point in pregnancy work should cease. The scope of a society's ability to pay was determined by a financial contract. It had been stated that one day's extra pay to everybody would mean complete financial breakdown of the Act. An insured person might be unfit but not incapable. To decide whether convalescent treatment should be given it was not a question whether it was beneficial but whether a stay at a convalescent home was necessary to recovery. Doctors and societies must interpret their legal obligation on common sense grounds except where there was serious suspicion of malingering. A huge proportion of insured persons were declared fit on

Saturday to resume work on Monday; was this the advice which the doctor gave to the patient or was it the patient who was then advising the doctor?

Dr. A. BALDIE thought that, whilst the average doctor was not a lawyer, in his own sphere he was very efficient. He was not allowed to alter the form of certificate and at times he must include people who were not really incapable. If the Act had been unable to stand the strain of the last nine years its actuarial basis must be wrong; but the doctors were blamed for it. Alteration in regulation and in the forms of certificates would enable insurance doctors to do their work properly and render the Act more popular.

Mr. FOSTER, in reply, pointed out that work was often quite beneficial to neurasthenic people. Doctors were "debarred" from giving certificates of incapacity in uncomplicated cases of pregnancy; he thought that was going rather far. The infective cases were very difficult. Additional benefit could be paid to an insured person because his relatives were ill with infection but not because the patient himself was infective, if not incapable. He did not think the alteration of certificate would help much, for the doctor would have to decide the category in which to put the patient and again references to the R.M.O. would still be necessary.

Novarsenobillon

The Birmingham insurance committee reports that the Minister has decided not to refer to referees the question whether the intravenous injection of novarsenobillon falls within the terms of those extra services outside the Act for which an insurance practitioner (with special qualifications to perform such services) may make a charge to the patient. This decision is in conformity with that of the local medical committee and of the insurance committee, both of which had agreed that this service was outside the Act. It is possible that the toxicity of the medicament rather than the degree of manipulative dexterity required has determined the decision, for the injection of varicose veins has been definitely held to be within the scope of the Act.

THE SERVICES

IMPROVED CONDITIONS FOR THE ROYAL AIR FORCE MEDICAL SERVICE

NEW regulations have now been issued embodying the recommendations of the Warren Fisher report. To lessen the strain of orderly duty and so increase the number of candidates for temporary commissions in the R.A.F.M.S. that orderly duty is to be reduced. Within five years about half of the short-service officers will be enabled to get permanent commissions. Those leaving for the reserve in three years will get a gratuity of £400 (£50 increase), increased after five years' service to £1000 (£300 increase). Permanent officers not qualified for retired pay and allowed to retire between five and ten years will get £1000 gratuity, after ten years £1500, and after 15 years £2800 (£300 increase). Promotion will be accelerated and increased throughout: pay of squadron leaders will be increased by 5s. daily, but without the present increase after eight years (when presumably they will have won their promotion); wing commanders and below can serve up to the age of 55, an extension of four years. Specialist pay is not now given as such to specialists, but in future they may win accelerated promotion (up to two years) to squadron leader. These changes offer definite prospect of better incomes to R.A.F. officers in future.

COMMISSIONS IN THE ROYAL ARMY MEDICAL CORPS

The War Office announces that applications are invited from medical men for appointment to commissions in the Royal Army Medical Corps under the new conditions announced recently. Candidates will be selected for commissions without competitive examination and will be required to present themselves in London for interview and physical examination on or about June 6th. They must be registered under the Medical Acts and normally must not be over the age of 28 years. Successful candidates will in the first instance be given short service commissions for five years, at the end of which period they may either retire with a gratuity of £1000 or apply for a permanent commission. Permanent commissions will be given to officers selected from among those who wish to make the army their permanent career.

Full particulars on application, either by letter or in person, to the assistant director-general, Army Medical Services, The War Office, London, S.W. 1.

ROYAL NAVAL MEDICAL SERVICE

Surg. Lt.-Comdrs. A. E. Phillips and G. Kirker to be Surg. Comdrs.

Surg. Lts. W. W. Beach, A. R. Ewart, and R. Russell to be Surg. Lt.-Comdrs.

ROYAL NAVAL VOLUNTEER RESERVE

Surg. Lt.-Comdr. (D) D. C. Lamond is placed on the retd. list.

Surg. Sub-Lt. K. W. Martin to be Surg. Lt.

The following appointments are notified: Surg. Lt.-Comdrs. C. C. Ungley to *Tiverton*, R. L. Stubbs to *Valiant*, and F. A. McLaughlin to *Malaya*.

Surg. Lt. G. M. Tanner to *Tiverton*.

ROYAL ARMY MEDICAL CORPS

Lts. J. E. Snow, N. H. Lindsay, C. S. Gross, W. R. M. Drew, and A. Macdonald to be Capts.

ARMY RESERVE OF OFFICERS

Lt.-Col. P. J. Marett having attained the age limit of liability to recall ceases to belong to the Res. of Off.

TERRITORIAL ARMY

Col. C. R. White, retd. T.A., vacates the appt. of Hon. Col. R.A.M.C. Units, 53rd (Welsh) Div., on completion of tenure.

Col. C. L. Isaac, retd. T.A., to be Hon. Col. R.A.M.C. Units, 53rd (Welsh) Div.

Maj. C. Helm (Lt.-Col. Res. of Off.), resigns his commn. in the T.A.

Lts. W. E. Underwood and W. E. Orchard to be Capts.

E. F. S. Morrison (late Cadet, Epsom Coll. Contgt., Jun. Div., O.T.C.), to be Lt.

J. A. Blain (late Cadet, St. Andrews Univ. Contgt., Sen. Div., O.T.C.), to be Lt.

TERRITORIAL ARMY RESERVE OF OFFICERS

Capt. W. H. A. Dodd resigns his commn.

Lt. H. R. Vernon, from Active List, to be Lt.

INDIAN MEDICAL SERVICE

Col. G. C. L. Kerans retires.

Majs. R. Hay, W. P. Hogg, and H. E. Murray to be Lt.-Cols.

Capt. J. S. B. Forde relinquishes his proby. appt.

ROYAL AIR FORCE

Flight Lt. J. Parry-Evans is promoted to the rank of Squadron Leader.

The undermentioned Flying Offrs. are promoted to the rank of Flight Lts.: J. McGovern, J. F. Dales, T. D. L. Bolan, and R. E. W. Fisher.

SPECIAL ARTICLES

GENERAL MEDICAL COUNCIL

PRESIDENT'S ADDRESS.

IN opening the 139th session of the Council, on May 29th, the President, Sir Norman Walker, after mentioning that the composition of the Council was the same as at the previous session, made graceful allusion to three one-time members who had died in the interval. Of Sir William Whitla, a member of the Council from 1910 to 1916, he said that his work on the Pharmacopœia Committee was extremely valuable, while of A. G. Barrs, who was a member of the Council from 1904 to 1918, he said that on the same committee a deep knowledge of therapeutics had been wisely employed. Of the third deceased member, Sir Donald MacAlister, he recorded the remarkable fact that his tenure of office had lasted 43 years, during 27 of which he had been President. After alluding to the many instances in the proceedings of the Council where MacAlister had given evidence of familiarity with every facet of the work, and to the practical employment to which his linguistic scholarship had been put, he pointed to his remarkable capacity as "a Moderator, as he would have been called in the Scottish Ecclesiastical Courts;" for only short and pertinent talking was encouraged by him, while throughout his whole term of office only in six years was a deficit displayed in the balance sheet of the Council; one such deficit was £7 8*s*., while before Sir Donald's time annual deficits would average £1000. Sir Norman continued:—

"The accounts for the year 1933 have been duly audited and presented to Parliament. They show a surplus of income over expenditure for the year of £564 7*s*. 4*d*., a surplus not so large as that of last year, but still satisfactory. I shall not trespass on the province of the treasurers by referring to any details.

In 1933 the names of 1343 practitioners were added to the Medical Register, being two less than in 1932. But the losses were 150 less, and so the Register on Jan. 1st, 1934, contained 56,741 names, the largest number ever reached. The Student's Register showed an increase of 340 names, 272 in England, 38 in Ireland, while Scotland stands just where it did last year. The Education and Examination Committees will doubtless take note of these figures.

MEDICAL EDUCATION

The General Council for Medical Education and Registration has as its main object the first of these subjects. The Education Committee was set up by the Council in 1859, and down the years successive education committees have submitted valuable reports, many of them still well worth study. Medical education and its bearing on the public weal is to-day the subject of anxious consideration in every civilised country. In the United States there have been far-reaching inquiries into medical practice and its many relations to the public, and a realisation that, as times change, it may be that education must change with them. Sir Henry Acland, through whose scholarly addresses I often go gleaning, said in 1887 "that the Council had received whatever aid can be derived from abundant criticism, which would have had more real value had it fully appreciated the difficulties of a period of progress never equalled." It is doubtful if there had been, in the years prior to 1887, so great and so rapid changes as there have been in the last 20 years. The boundaries of medicine are ever extending, and there is more and more to be learned. The Council welcome all the inquiries which are going on as likely to contribute to the solution of a difficult problem. But it is right here to make clear the position of the Council. It is not possible to frame a model curriculum which will suit every country or every school in any country, and no hard-and-fast arrangement of subjects is possible, even if it were desirable.

In this connexion, the Royal Commission of 1882, on whose report the 1886 Act is based, said: "It would be a mistake to introduce absolute uniformity into medical education. One great merit of the present system, so far as teaching is concerned, lies in the elasticity which is produced by the variety and number of educational bodies. Being anxious not to diminish in any way the interest which the teaching bodies now take in medical education, or to lessen their responsibility in that respect, we desire to leave them as much initiative as possible. In certain matters of general importance, such as the duration of study, and the age at which a student should be permitted to practise, common regulations ought, we think, to be laid down; but we wish to record our opinion that nothing should be done to weaken the individuality of the universities and corporations, or to check emulation between the leading institutions of the country." This policy has been followed by the General Medical Council, whose primary concern is with the qualifications for admission to the Medical Register. These are the words of the 1886 Act: "The standard of proficiency required from candidates at the said qualifying examination shall be such as sufficiently to guarantee the possession of the knowledge and skill requisite for the efficient practice of medicine, surgery, and midwifery, and it shall be the duty of the General Medical Council to secure the maintenance of such standard of proficiency as aforesaid." Each licensing body is free to try out new methods, and those which are found successful are likely to be imitated and perhaps improved on by others. I do not think it is sufficiently realised in other countries how much we gain from our unique system of external examiners; this meeting of teachers from different schools is perhaps the most efficient way of diffusing information. The Education Committee have been hard at work since last we met; their report, which was yet in its final form this forenoon, will be in your hands, I hope, to-morrow, and it is proposed to set aside Friday forenoon for its discussion.

THE PHARMACOPŒIA COMMISSION

The Pharmacopœia Committee will pass on to us the report of this Commission, which shows that that body have been diligently engaged in preparing the ground for the next Pharmacopœia, and the laboratory provided in this building has been very useful in connexion with their researches.

PROGRESS IN HONG KONG, SINGAPORE, AND CEYLON

The executive committee has considered reports by Sir Richard Needham on Hong Kong and Singapore. These show how useful it is to these far-away schools to have a visitor from this country with a full knowledge of the conditions of medical education in this country, and both Hong Kong and Singapore are grateful for the help they have received from our visitor. Sir Richard at Ceylon revisited the Medical College, and reports that many of the improvements

suggested have been, or are in process of being, carried out."

At the conclusion of his address a vote of thanks to the President was proposed by Dr. Sydney Smith and seconded by Dr. J. W. Bone. Dr. H. Guy Dain, the new direct representative of the practitioners of England and Wales, was introduced by Sir Henry Brackenbury and took his seat. Sir Robert Bolam was elected chairman of business.

The death of Sir Donald MacAlister having left Sir Holburt Waring as the sole surviving trustee, the Council confirmed the appointment, already made provisionally, of Mr. Bishop Harman, Dr. J. S. B. Stopford, and Dr. Letherby Tidy as trustees of the General Council with effect from Feb. 26th, 1934.

The Council then proceeded to the consideration of penal cases.

THE MIDWIFE'S TRAINING AND EDUCATION

A DISCUSSION on the

Training and Education of Midwives

to which professors of obstetrics and other medical men were invited to contribute, was included in the programme of the Sixth Congress of the International Midwives' Union, held at the Midwives' Institute from May 25th to 29th.

Dr. J. S. FAIRBAIRN (chairman, Central Midwives Board), who presided, said that in this country nurses had got a start over midwives, owing mainly to the work of Florence Nightingale, who had raised the nursing profession to a high plane. There had been a tendency to tack midwifery on to nursing, but midwives wished to be recognised as members of an entirely independent profession, with a training as good as that given in other countries and of equal importance to the training of a general nurse. There were, however, two outstanding needs in the education and training of midwives. First, some way must be found to limit the entry to the examination of the Central Midwives Board of an enormous number of candidates who had no intention of practising as midwives. The presence of so many students made it impossible to train or examine efficiently those who were making midwifery their profession. Secondly, midwives needed refresher courses from time to time after qualification. There were cases in which a woman had begun to practise, had married and had a family, and then became a widow. In order to earn a living she returned to midwifery practice and because her name was on the roll she had the right to resume practice without taking any further course of study. The only circumstances in which the C.M.B. could insist upon attendance at a refresher course were cases of negligence or breach of the rules.

Prof. FRANZ DAELS (Ghent University) welcomed the concentration of the Congress upon education in the wider sense rather than upon formal instruction. Social and moral education was of capital importance for the midwife, because the people gave her their complete confidence. The midwife was better qualified than the doctor to give the sort of help wanted by mothers. Dr. Daels said that many young girls of 14 or 15, who had taken care of younger brothers and sisters at home, felt a real desire to become midwives. But they were not allowed to begin their training until the age of 20, and in the meantime they went into shops or factories, and some girls with a real vocation were lost to the profession. Education in responsibility was necessary in the training of a midwife. To bear a great name carried with it a responsibility, and surely the midwife—the "sage-femme"—bore a great name. Dr. Daels believed more in training by a good midwife than by a doctor. Whereas the doctor merely passed through a training school, a woman at the head of such a school had given the best part of her life to it, and it was her one great interest.

Prof. J. M. MUNRO KERR (University of Glasgow) said we had taken the wrong turning in midwifery in this country 150 to 200 years ago. If the College of Midwives visualised by Chamberlen and his family had been established, we should probably have developed the midwifery profession instead of the man midwifery service of which Smellie and Hunter were the great exponents in London. Midwifery service had never been really tackled until the beginning of this century. It had made enormous progress, but perfection could not be achieved in 35 years. The departmental committee's report on the training and education of midwives (1929) proclaimed that routine service and supervision of pregnant and parturient women, at least of the insured class, should be in the hands of midwives. He believed midwives were ready to assume that responsibility and capable of carrying it out, but they could not do it with the training and examination they were now getting, nor unless they were assured of suitable employment, a comfortable home, and a pension. Far too many women were being trained. In 1933, 575 women presented themselves for the C.M.B. examination in Scotland, and 92 per cent. passed. It was preposterous that only 8 per cent. of candidates should fail in an examination admitting to so responsible a profession. Prof. Kerr disapproved of the system of training midwives with medical students. Medical students should have all the clinical material at the university centres, and midwives could equally well be taught in other large towns. The only way to guarantee employment with a living wage was to establish a municipal service with midwives working under the supervision of the local authorities. They should do their work from the local authority's clinics, keeping their bags and records there. No woman could properly deal with more than 100 cases in a year. Care of the normal woman should be learned in antenatal clinics, not in antenatal wards, which only took abnormal cases. A clinical examination should be insisted upon.

Prof. CHARLES BURGER (Budapest University) thought the theoretical was usually better than the practical training in midwifery. He regarded refresher courses as vitally important. There were midwives practising who had added nothing to their knowledge for 30 years. In the last year 259 voluntary refresher courses had been arranged for midwives in Hungary, and 3000 women had attended. Probably such courses would be made compulsory in the future. A sound midwifery service was the safest for the mother. The hands of the general practitioner were less clean, surgically speaking, than those of a midwife attending normal cases, but if the midwife was not reserved for normal cases her own hands would be less surgically clean than one would wish. Eight years ago new regulations were introduced in Hungary, by which complete records of all maternity cases were sent to the Ministry of Health, and there classified and compared. This had the advantage of securing regular and reliable data alike from doctors, midwives, and institutions.

Mr. L. CARNAC RIVETT (Queen Charlotte's and Middlesex Hospitals) said that while he agreed with Prof. Munro Kerr that 100 cases was as many as a midwife ought to undertake in a year, and while he would like to see her adequately paid, he strongly deprecated the idea of all midwives being employed by local authorities. He did not agree that midwives and students should not be trained together. If the student was being taught to be a gynæcologist and the midwife merely a maternity nurse, of course they could not be trained in the same clinics; but if, as ought to be the case, they were both being taught to be obstetricians, the training should be the same. At Queen Charlotte's both students and midwives were taught in the antenatal clinics. Midwives should be given an extensive training in antenatal care, and Mr. Rivett believed that in many instances midwives could be allowed to treat antenatal cases. They should be fully trained in the use of analgesics for labour. The Central Midwives Board seemed to be frightened of itself: it gave midwives the right to use certain drugs, and then qualified the permission by leaving local authorities free to prohibit their use. Midwifery had a great future before it, but we must raise the practice of midwifery and of obstetric practice generally to a much higher standard.

Dr. R. CHRISTIE BROWN (City of London Maternity Hospital) agreed with Prof. Munro Kerr that a municipal service was the only way in which to secure the midwife an adequate salary. He would like midwifery training schools to be attached to large hospitals. The training should last at least two years, the preliminary part being taken under a sister tutor and including instruction in such subjects as elementary anatomy, physiology, and bacteriology, in order to give the midwife a grasp of the general principles of her work. In the later stages there should be less lectures, and more practical demonstrations in the hospital and in the museum. He did not think it would be fair to insist on attendance at post-graduate courses, but would like to see an association of midwives on the lines of the Royal Society of Medicine, with a life subscription. This would encourage the holding of meetings for free discussion—a very different thing from attending compulsory lectures.

Dr. W. H. F. OXLEY (East End Maternity Hospital) said the idea of a State midwifery service was fascinating to some people, but others had had more official supervision than they wanted. It was true that in some instances a midwife left to herself would not make a living. There might be a modified scheme by which a supervising authority would subsidise those midwives who needed it. The authority would have the right to say how many midwives were to practise in the area, and to decide in which towns they were needed. Such a scheme, properly constituted, could, he believed, become a State midwifery service satisfactory to the midwives and helpful to the mothers.

Mr. A. J. WRIGLEY (St. Thomas's Hospital) said it had been proposed to restrict the number of candidates for the midwifery profession by some examination to raise the standard of general education. In his opinion the most helpful and practical midwives, and those who inspired the greatest confidence in their patients, were often those who had qualified with some difficulty. He doubted whether we should improve matters by insisting on matriculation.

Dr. A. MORRIS JOHNS (Queen Charlotte's Hospital) did not think examinations were much to go by. The best examinee was rarely the best midwife. He did not agree with Mr. Carnac Rivett that the training of midwives and medical students together was a success: it would be better to train them in separate hospitals.

Dr. FAIRBAIRN resisted the temptation to put to rights the doctors who had disagreed, because, as he said, the points of disagreement were largely matters of specially British application. He pointed out that for many years the Midwives' Institute had been carrying on exactly the kind of thing proposed by Dr. Christie Brown in his suggestion to form a society for midwives on the lines of the Royal Society of Medicine.

Miss E. M. PYE (President, Midwives' Institute) thanked all those medical men who had come and shown so real an interest in the problems of midwives, especially those who had come from abroad.

All the speeches were given in French, German, and English, Prof. Daels alone among the speakers acting as his own interpreter.

THE BASIS OF A MILK POLICY

REPORT OF THE COMMITTEE ON CATTLE DISEASES

AT the beginning of November, 1932, the Prime Minister appointed a committee of the Economic Advisory Council, asking it to consider what practical measures could be taken to secure a reduction of disease among milch cattle in this country, and to report upon any changes desirable in the existing administrative practice—in particular upon the value and practicability of methods for reducing the incidence of bovine tuberculosis and improving the milk-supply. The personnel of this committee was as follows: Sir Gowland Hopkins, P.R.S. (chairman), Sir Merrik Burrell, Prof. E. P. Cathcart, M.D., F.R.S., Dr. A. Stanley Griffith, Sir Charles Harris, Prof. J. H. Jones, and Sir John Moore, F.R.C.V.S. This committee has held 32 meetings to hear evidence, has received reports from Government departments at home and abroad, from research institutes and other authoritative sources, and on Monday last issued its considered report.[1]

Since the appointment of the Committee, marketing boards have been set up and the Government has made a grant of £750,000 to assist in obtaining a purer milk-supply; but in preparing its report the Committee has confined itself to laying down the principles of a long term policy. It has not felt called upon to offer suggestions for the adaptation of these principles to the immediate situation. At the conclusion of the report there are a series of 25 recommendations, many of which carry far-reaching consequences. Those bearing on the eradication of bovine tuberculosis and on the regulations governing the grading of milk and pasteurisation demand immediate attention.

Eradication of Bovine Tuberculosis

In Great Britain at a point of time mentioned in the report there were 2,763,000 cows and heifers in 200,000 herds producing 1425 million gallons of milk in the year. The incidence of bovine tuberculosis among these cattle, the Committee says, is probably as high in Great Britain as anywhere else in the world. The generally accepted conclusion that at least 40 per cent. of cows in dairy herds are infected with tuberculosis does not appear to be exaggerated, but the Committee found no evidence to show

[1] Economic Advisory Council: Committee on Cattle Diseases. Report presented to Parliament, May, 1934. London: H.M. Stat. Office. Cmd. 4591. 2s. 6d.

whether the disease is increasing or diminishing in Great Britain; the widespread neglect of adequate precautions against its increase makes any diminution improbable. No cure for tuberculosis is known. Immunisation with BCG may soon approach a stage of practical usefulness, but to-day is not an important outwork in the farmers' defence. The eradication of bovine tuberculosis in cattle would lead to its disappearance in swine as well as in horses, goats, and cats. The scheme proposed for the eradication of bovine tuberculosis recommended by the Committee should in its opinion provide for:—

(1) The institution of a list of tuberculosis-free herds (accepted herds), tested with tuberculin from time to time under official supervision, and declared to be free from bovine tuberculosis.

(2) The provision of free advice and free tuberculin-testing for owners of herds who agree to make bona-fide efforts to free their herds from tuberculosis, or who have established free herds.

(3) Financial help, where necessary, by way of loans or the guarantee of loans, to approved owners for the purpose of undertaking expenditure required by the veterinary inspector as necessary to eradication.

(4) The securing to owners of disease-free herds of a higher price for their milk than that obtained by other owners.

(5) The taking of administrative measures designed to secure that tuberculosis-free cattle from accepted herds should be moved about the country and exposed for sale without running the risk of being brought in contact with other cattle.

(6) The adjustment of regulations governing the production of graded milks and the grades of milk officially approved, and the making of regulations relative to the compulsory pasteurisation of milk with a view to increasing the incentive to farmers to eradicate tuberculosis from their herds.

As far as human health is concerned bovine tuberculosis is regarded as the only material danger from milk. Contagious abortion may be responsible for serious loss to dairy farmers, both directly and indirectly by causing sterility, even if the suggested 40 per cent. prevalence is not grounded upon adequate statistical investigation. Undulant fever, its counterpart in man, is, however, rare in this country and would still be unimportant even were its incidence as high as in Germany. The real protection of the public from this fever, the report remarks, is their own immunity. About the importance of milk in the spreading of other infectious diseases the available evidence is regarded as inconclusive. Such milk-borne infections however have one peculiarity—the organisms responsible for them multiply rapidly in milk; the pooling of milk consequently adds enormously to the chances of infection.

The only remedy, even tolerably complete, for the condition into which our dairy industry has been allowed to fall is the complete eradication of bovine tuberculosis from the herds. The limiting conditions of such action at the outset are the lack of trained veterinary staff and the shortage of healthy cows available to replace those infected. The uncoördinated initiative of individual farmers under the stimulus of higher prices for pure milk at a rather distant future will not of itself create the necessary conditions for any general advance. For this reason it is essential that the Ministry of Agriculture should take an active hand in planning and subsequently in directing the campaign for eradication, especially in its early stages.

The Grading of Milk

The Committee considers that all milk sold for consumption in liquid form should be required to be sold under an official designation. The designation of the milk should be clearly marked on the vessel in which it is sold to the public, a distinctive colour being prescribed for marking each designated milk. No liquid milk should be sold that does not attain a fixed standard of cleanliness, or pre-pasteurisation standard, at the farm. This standard should approximate to that at present required for Grade A milk. In addition, all milk should conform to the definitions of one of the following designations:

(1) *Certified milk*—namely, milk which has not undergone any process of heat-treatment and is derived from tubercle-free herds. This milk should not be required to be bottled on the farm.

(2) *Pasteurised milk*—namely, milk which has undergone, once only, a process of heat-treatment approved for this purpose by the Ministry of Health or the Department of Health for Scotland, and has undergone no other process of heat-treatment. Pasteurisation should be permitted only in a plant licensed for the purpose.

(3) *Sterilised milk*—namely, milk which has been raised to the boiling-point or higher in a plant licensed for the purpose, and which has undergone no other process of heat-treatment.

(4) *Milk (uncertified)*—namely, milk which has undergone no form of heat-treatment and is not derived from tuberculosis-free herds, but which attains a certain hygienic standard.

No milk which has been held in any vessel containing more than 100 gallons of milk, unless derived from a single herd, should be sold for consumption in liquid form unless it has subsequently been pasteurised.

The council of any county borough, municipal borough, large burgh, or urban district in an area the population of which exceeds 100,000, and the London County Council should have the right to prohibit the sale of milk (uncertified) as defined above after a date which shall not be earlier than five years after the initiation of the scheme of eradication, provided that it has given not less than two years' notice of its intention to do so.

Pasteurisation

The pasteurisation of milk to be sold under the order should only be permitted in plants the design of which has been officially approved, which have themselves been tested on erection to ensure that they conform to the approved design, and which are frequently inspected during working by an officer of the sanitary authority, who should apply prescribed tests and record the results at each visit. The authority responsible for approving the design of plants should act only after consulting the National Physical Laboratory.

It is emphasised that pasteurisation cannot make dirty milk clean and, therefore, would not discourage farmers from producing clean milk. If correctly introduced, it would encourage them to undertake eradication. On the other hand, the compulsory pasteurisation of milk would disturb the balance at present existing in large towns between the producers of milk in comparatively distant areas for sale after heat-treatment, and the producers of milk in the immediate neighbourhood of large towns for sale in a raw state. Pasteurisation is incompatible with the business methods of producer-retailers and, if it were made compulsory at once, a large number of them would be deprived of their present livelihood.

No policy at the outset satisfies both the interests of public health and those of producer-retailers near large towns. Clinical inspection is not a satisfactory alternative to pasteurisation in those areas where the latter is practicable, nor could producer-retailers make their milk safe by the eradication of tuberculosis until this has made considerable progress in the

breeding areas. But, as soon as a sufficient supply of clean cows can be created to enable producer-retailers to free their herds from tuberculosis, it will be fair to make them choose between doing so and submitting to pasteurisation.

IRELAND

(FROM OUR OWN CORRESPONDENT)

BOVINE TUBERCULOSIS AND MILK

IN the Dáil last week Mr. S. T. O'Kelly, Minister for Local Government and Public Health, gave assurances that he would soon be ready to introduce the long-promised Bill to deal with the milk-supply. He did not pledge himself that it could be brought in during the present session, but he stated that his advisers had been busy with it, and had now overcome the difficulties that had previously stood in their way. The history of this measure is interesting. Early in 1928 the report of an Inter-Departmental Committee on the Milk Supply was presented, and the then Minister promised early legislation to carry the recommendations into effect. Some fifteen months later he outlined his proposed legislation to the Dáil, but nothing more was heard of the Bill. The present Minister took up office early in 1932 and in autumn of that year declared his intention of bringing in a Milk Bill. Until his announcement last week he had not reverted to the subject. The proposal to impose conditions on the production and distribution of milk is unpopular with the farmers, and the Minister must make up his mind to meet plenty of opposition both within and without his own party, for the agricultural interest is strong in the Dáil. The present moment, however, offers an exceptional opportunity for dealing radically with the problem of tuberculosis in cattle if the Government has the determination to seize it. Never in history has the price of stock been so low, and if the Government were to decide to destroy all tuberculous strains in cattle it could be done at relatively small expense. The Minister for Agriculture, indeed, threw out a hint some weeks ago that his mind was running in this direction. He has stated definitely more than once that the number of cattle in the country was more than its needs required, and he suggested that in reducing the surplus attention should be paid to the destruction of tuberculous stock.

MEDICINE AND THE LAW

Cheese, Natural or Synthetic

To the question "what is cheese?" the Food and Drugs (Adulteration) Act replies that it is "the substance usually known as cheese"—a conclusion which would perhaps have been reached by magistrates without statutory aid. The definition does, however, go on to stipulate that the substance must contain no fat derived otherwise than from milk. This stipulation was vital in a recent prosecution by the Islington borough council in a case where a public-house licensee had sold as a cheese sandwich a substance containing 41 per cent. of fat other than milk fat. The additional ingredient was stated to be beef fat. The addition brought the cheese sandwich within the statutory definition of "margarine cheese"—i.e., "any substance whether compound or otherwise which is prepared in imitation of cheese and which contains fat not derived from milk." The defendant in the Islington case explained that real cheese would go mouldy. The magistrate held that the purchaser of one of these cheese sandwiches would expect to buy a sandwich composed of biscuit and real cheese; purchasers were not getting an article of the nature, substance, and quality demanded. In view presumably of the absence of any sinister feature in what was a test case, the magistrate did not record a conviction but merely dismissed the summons on payment of two guineas costs. Future defendants in similar circumstances will perhaps escape less lightly.

In discussing lately the report of the departmental committee on food standards (THE LANCET, May 19th, p. 1076), it was mentioned that the purchaser of cheese gets articles with varying proportions of fat for which no statutory limit is prescribed. Statutory percentages are somewhat complicated to enforce, though the Sale of Milk Regulations have for a long time fixed a certain minimum of milk fat below which the milk is prima facie deemed not genuine by reason of the abstraction therefrom of milk fat or the addition thereto of water. A more ambitious effort is made by the standard set up under the Agricultural Produce (Grading and Marking) Act for Cheshire cheese; here there is a general requirement that the cheese shall be made from full-cream cow's milk "and shall contain a minimum of 45 per cent. of butter fat in the moisture-free substance." For the purpose of the Food and Drugs (Adulteration) Act there is no such standard. The recent departmental committee heard evidence specifically about cheese, but refrained from any recommendation. In effect, therefore, the producer and seller of cheese can take the fat out of the article so long as they put no other fat in.

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED MAY 19TH, 1934

Notifications.—The following cases of infectious disease were notified during the week: Small-pox, 4 (last week 3); scarlet fever, 2428; diphtheria, 1197; enteric fever, 21; acute pneumonia (primary or influenzal), 989; puerperal fever, 33; puerperal pyrexia, 116; cerebro-spinal fever, 36; acute poliomyelitis, 3; encephalitis lethargica, 14; dysentery, 7; ophthalmia neonatorum, 86. No case of cholera, plague or typhus fever was notified during the week.

The number of cases in the Infectious Hospitals of the London County Council on May 28th–29th was as follows: Small-pox, 9 under treatment, 0 under observation (last week 14 and 0 respectively); scarlet fever, 1622; diphtheria, 1698; measles, 2363 (last week 2493); whooping-cough, 302; puerperal fever, 32 mothers (plus 11 babies); encephalitis lethargica, 258; poliomyelitis, 2; "other diseases," 125. At St. Margaret's Hospital there were 18 babies (plus 9 mothers) with ophthalmia neonatorum.

Deaths.—In 121 great towns, including London, there was no death from small-pox or enteric fever, 55 (18) from measles, 8 (0) from scarlet fever, 38 (7) from whooping-cough, 47 (11) from diphtheria, 43 (13) from diarrhœa and enteritis under two years, and 33 (2) from influenza. The figures in parentheses are those for London itself.

Liverpool and Newcastle-on-Tyne each reported 5 fatal cases of measles, West Ham 3, no other great town more than 2. Liverpool also reported 8 deaths from whooping-cough, Sheffield and Birmingham each 3. Diphtheria proved fatal in 5 cases at Manchester, 3 at Liverpool.

The number of stillbirths notified during the week was 289 (corresponding to a rate of 43 per 1000 total births), including 45 in London.

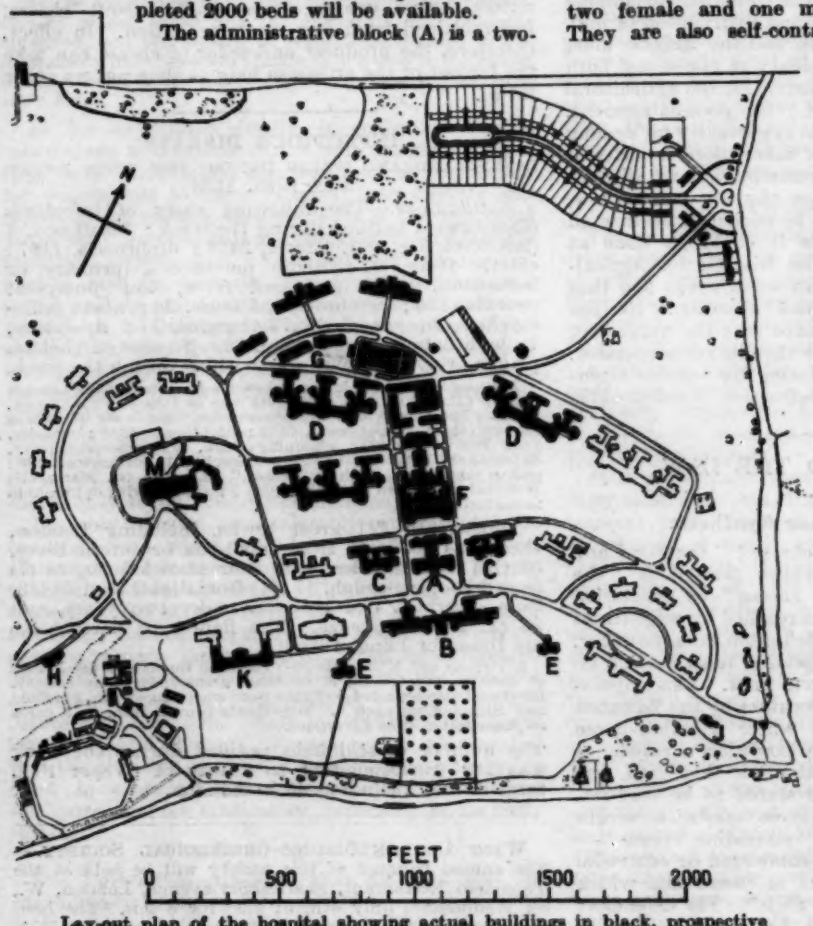
WEST LONDON MEDICO-CHIRURGICAL SOCIETY.—The annual banquet of this society will be held at the Trocadero Restaurant, Shaftesbury-avenue, London, W., on Wednesday, July 4th, at 7.30 for 8 P.M. The hon. secretary may be addressed at 19, Queen Anne-street, W.1.

SHENLEY MENTAL HOSPITAL

THE new Middlesex mental hospital at Shenley, near St. Albans, was opened by H.M. The King on Thursday last. The need of more accommodation for mental cases in the northern part of Greater London was brought home to the county authority as long ago as 1911. In 1924 the Porters Park Estate, including a large mansion, the property of Mr. Raphael, came into the market and was bought by the Middlesex county council for £80,000. Besides the mansion and its accessories there are two farms, some cottage property, and a large area of woodland and arable land, totalling just over 1166 acres. The council selected 500 acres of this to found the new hospital, situated for the most part on a ridge 420 ft. above sea level, with an extensive view over Hertfordshire to north and south. Building was commenced in 1932 to the plans of the county architect, Mr. W. T. Curtis, F.R.I.B.A., the contractors being John Laing and Son, Ltd., of Mill Hill. In July, 1932, the foundation-stone was laid by Sir William Lobjoit, chairman of the mental hospitals committee. The hospital is planned on the villa system with small nursing units ranging from 20 to 45 patients. The first section of the building scheme now completed has beds for 1047 patients and about 500 staff. Some 500 patients were admitted during January. When the hospital is completed 2000 beds will be available.

The administrative block (A) is a two-storey building, being approximately in the centre of the colony; on either side of it are the separate villas and hospitals for male and female patients; behind are the recreation hall, kitchen, laundry, and stores. In the central building are the usual offices and committee rooms below, and above the flats for the resident doctors. The laboratories, operating theatre, dispensary, and dental room on the north side are all admirably equipped. The dental chair and apparatus are of modern English make, with electric control; mirrors and instruments are attached to cords which spring back into sockets when released. As there is no supply of gas to the colony in general a small petrol engine has been installed to supply the bunsen burners and other open flames required in the laboratory work.

The reception hospital (B) to the south of this block will house 40 patients of either sex; the doctors' offices and examination rooms lie round the centre hall, the wards and several private rooms to east and west. As throughout the colony where patients are concerned this block faces south. Every patient is admitted to this building and moved as soon as possible after a mental and physical examination to a suitable department. The hospital blocks proper (C) are self-contained nursing units on the ground and first floors. There is a large south verandah where beds can be wheeled outside without any difficulty. Each has a small surgical ward of three beds. Behind these are the closed blocks (D), two female and one male, for more acute cases. They are also self-contained, with day and night wards, kitchen, baths, and lavatories. A home-like appearance has been studied and there are no long corridors, the wings of each block being separate wards opening out of the main building by glass doors. The decorations and furniture are simple and of modern design in pleasing colour; in the sitting rooms railway posters give an extra note of cheerfulness. In these blocks also there are some private and single rooms and several padded rooms for violent cases. Noteworthy are the two small convalescent villas (E) planned and furnished as nearly as possible to home conditions, looking out on lawns and orchards.



Lay-out plan of the hospital showing actual buildings in black, prospective buildings in outline

The grounds are still in process of development. Borders and shrubberies have been laid out and a large wooded area is to be cleared of brushwood for walking exercise within the boundary. The woodland has been left untouched where possible and there are many fine forest trees standing. The absence of fences, which is very gratifying to the practised eye, will, it is to be hoped, justify an optimistic experiment. Small hedges have

Admission hospital, south elevation [Photo. by Hills, Offen & Co.

been planted to divide the various blocks; otherwise they are only separated by paths. The fences round the closed blocks for acute cases are painted green, and it is hoped to have climbing plants on them. The usual institution brick walls are nowhere to be seen and there is nothing to suggest imprisonment to patients or their friends, or to offend the eye of neighbours.

One of the women's wards

The recreation room (F) in which the opening ceremony took place is a spacious hall, seating 1000 persons, with a floor of polished wood well sprung for dancing. The stage has modern lighting and curtains with dressing rooms for the performers; and underneath it chairs can be stored. The room is also equipped with a talking cinema and wireless, the latter being relayed to every ward in the colony. A

A day room for women

smaller room adjoining can be used for lectures or services. In it too refreshments can be secured during entertainments from a recess in direct contact with the kitchen. This is capable of cooking for 2500 persons by electricity or steam. The food is carried on insulated trolleys to the various blocks and the patients have all their meals in their own dining rooms. The menus are on a monthly system which allows for greater variety and avoids the foreknowledge of what dish is to be expected on a particular day of the week.

Variety has also been considered in the patients' dress; evidence for this is in the large store room behind the kitchen. There is no fixed uniform: the women have a choice of coats, skirts, and jumpers; the men a selection of tweed suits, shirts, and ties; so that a patient is not conspicuous outside the institution. Interest in clothes is regarded as conducive to self-respect. Occupational therapy is carried on in a separate building (G) with three large bright rooms, in addition to the large amount of similar work in the wards. The wool rugs, the cane wastepaper baskets, the trays and stools are testimony to what even chronic patients can be taught to do.

Of the other new buildings on the estate there are separate houses for the medical superintendent, Dr. G. W. Shore (H), and his deputy (J) as well as 24 cottages for the married male staff. The nurses' home (K) is a particularly bright and attractive house on the south side of the colony, self-contained with a separate kitchen of its own. Each nurse has her own room with hot and cold water laid on, the matron and assistant matron having their own small suites. A wide terrace overlooks a run of four tennis courts. The mansion (M) is not at present occupied, but it is hoped to use it later for private paying patients and early cases. A staff village occupies the north-east corner of the site.

This modern hospital for the rate-aided mental patient is a tremendous advance on the mental hospitals of even a few years ago, and will lead to emulation on the part of other county authorities that can contemplate the expense, which has so far been in the neighbourhood of £520,000. It would be desirable to give the general public very free access to this hospital and the opportunity to realise that the patients could not be better looked after in many private homes than they are here.

CORRESPONDENCE

TREATMENT OF MYASTHENIA GRAVIS WITH PHYSOSTIGMINE

To the Editor of THE LANCET

SIR,—The abnormal fatiguability in myasthenia gravis has been thought to be due to curare-like poisoning of the motor nerve-endings or of the "myoneural junctions" in the affected muscles. It occurred to me recently that it would be worth while to try the effect of physostigmine, a partial antagonist to curare, on a case of myasthenia gravis at present in St. Alfege's Hospital, in the hope that it would counteract the effect of the unknown substance which might be exerting a curare-like effect on the myoneural junctions. I found that hypodermic injections of physostigmine salicylate did have a striking though temporary effect.

Mrs. M., aged 56, had had a previous attack of myasthenia gravis, lasting about six months, 14 years ago. Gastric ulcer four years ago. Non-specific infective arthritis seven months ago, now improved.

Towards the end of last February she found that she was unable to hold her shopping bag, and that her head used to fall forwards when she knelt to do the hearth. She had to remain in bed after March 18th, and had difficulty in sitting up. Her jaw then began to droop, she had to hold it up with her hand, and the left eyelid began to droop. Speech became indistinct when she was excited, swallowing was difficult, and fluid sometimes regurgitated through her nose. She was admitted to the hospital on March 28th, and a few days later weakness came on in the middle and ring fingers of both hands. The weakness is much increased by excitement, and is lessened by rest. It becomes worse as the day goes on. There is no wasting, and the tendon reflexes are all present. The masseters respond slightly or not at all to faradism; a myasthenic reaction has been obtained in the left deltoid. Radiograms show obsolete pulmonary tuberculosis. The thymus is not enlarged.

On April 11th treatment with hypodermic injections of physostigmine salicylate, gr. 1/60 once a day, was begun. In from half an hour to an hour after the injection the left eyelid "goes up" (see Figure), arm movements are much stronger, the jaw drops rather less, swallowing is improved, and the patient feels "less heavy." The effect wears off gradually in from 2–4 hours. With injections of gr. 1/50 the improvement is greater, and it lasts for 4–5 hours. Still greater improvement, lasting for 6–7 hours, followed an injection of gr. 1/45, but the patient felt rather faint and trembly, her "inside seemed all on the work," and she felt as if "something were going to happen." These feelings did not completely disappear till an hour after the injection. In all, 26 injections of physostigmine salicylate have been given. The effect is not quite uniform; on two occasions injections of gr. 1/45 and gr. 1/60 failed

Before injection the patient cannot raise her left eyelid. Thirty minutes after it the eye is fully open. (The photographs are reproduced from a cinematograph film and are reversed left for right.)

to produce any obvious effect. She feels better and more cheerful since the injections were begun.

Given by the mouth, physostigmine salicylate gr. 1/60 produced no obvious effect, but an hour after gr. 1/30 slight improvement occurred. No improvement followed control injections of water, pilocarpine gr. 1/20, strychnine gr. 1/30, adrenaline ℥5, ephedrine gr. ½, or acetylcholine 0·05 and 0·1 g.

I think that this effect of physostigmine on myasthenia gravis is important, though it is only temporary, for it improves swallowing and might tide a patient over a respiratory crisis. It supports the opinion that the fatiguability is due to a poisoning of the motor end-organs, or "myoneural junctions,"

rather than to an affection of the muscle itself. It may be significant that physostigmine inhibits the action of the esterase which destroys acetylcholine. I have not had the opportunity of treating another case to confirm the findings. The administration of other drugs whose action resembles that of physostigmine is under consideration. It is also possible that physostigmine might be of some service in botulism and in cobra poisoning, in both of which a curare-like poisoning of the "myoneural junctions" of the respiratory muscles has been stated to be the main cause of death.

I wish to thank Dr. Philip Hamill for his interest and advice, and Dr. W. D. Wiggins, medical superintendent of the hospital, for permission to publish the case.

I am, Sir, yours faithfully,

M. B. WALKER.

St. Alfege's Hospital, Greenwich, May 12th.

COLLAPSE THERAPY IN PNEUMONIA

To the Editor of THE LANCET

SIR,—The annotation on p. 1127 of your last issue leads me to seek the hospitality of your columns in order to state my views on the position of this method of treating pneumonia. Artificial pneumothorax is not to be regarded as a specific for lobar pneumonia; the induction may have no effect on the progress of the disease or may even make it worse. Used, however, strictly according to the technique described, I am convinced that a crisis can be produced in a few hours and the patient cured in the majority of cases. For this the correct technique is essential and disappointment has, I believe, been caused by failure to adjust the size or spacing of the fills. A four-hourly chart of the respiration-rate will help as a check on the progress of treatment.

The first fill must always be large, 350–550 c.cm., depending on the physique of the patient and the day of disease. The earlier the day, the larger the fill necessary, no attention being paid to the manometric readings. It will be found that in a few hours there will be a marked fall in the respiration curve, and if the fill is adequate the rate should drop to 22–25. The second fill, given 12–24 hours later, will require to be almost as large as the first, although as conditions should by now be more normal the pressure readings of the manometer can here be of some assistance. If the respiration-rate 12 hours after the first fill is under 25 the second fill can be postponed to 24 hours, but not longer. After the second fill the respiration-rate will steady at 20–22, and if this is maintained no further treatment is necessary. A temporary peaking of the curve to 25 can be disregarded, but if the curve again rises above 25 a third fill is advisable, while should it rise above 28 this fill is necessary. It need usually only be a small one, 200–250 c.cm., but it is wise to err on the side of overfilling as the air is absorbed very rapidly.

The technique thus elaborated is based on a definite conception of the pathology of lobar pneumonia and of the mechanism of the natural crisis.

I am, Sir, yours faithfully,

Hull, May 27th. J. J. COGHLAN.

BILATERAL EMPYEMA

To the Editor of THE LANCET

SIR,—The communication of Mr. D'Arcy McCrea in your issue of May 26th (p. 1117) attracted my attention, because I have had myself several cases of bilateral empyema: first as a chief physician of Imperial Sanatoriums in Russia and then during the war, especially in large hospitals in Finland. The first case I had was in 1909, at Irkutsk Hospital in East Siberia, which was demonstrated then by my senior colleague, Dr. N. Bessonoff. The method he applied, and which I followed with outstanding success afterwards and demonstrated to the students and my colleagues, is very simple. First of all it is necessary to replace the aspirated pus by saline solution with addition of a very dilute solution of iodine. This diminishes possibility of collection of pus in the cavity, leaving the pressure practically the same, also diluting and disinfecting the remaining contents. I used as a rule Potain's aspirator with two bottles connected with the same needle; one bottle with negative pressure, the other with positive. By changing taps I could either aspirate or introduce certain liquids. Bottles are graduated, so it was easy to reinstate the original pressure in the cavity. As a rule I introduced just a little less than I aspirated, in order to reduce the pressure somewhat. I never treated both sides simultaneously and always under control of X ray pictures before and after the manipulation. Unfortunately I had no chance to keep exact statistics, but the number of cases was not less than 80 and the mortality was very low.

I am, Sir, yours faithfully,

London, May 28th. B. PEROTT.

PETER DE ALCOBASSE

To the Editor of THE LANCET

SIR,—The quotation from Hutchins, "Hist. of Dorset," cited in the article on Alcobasse, Henry IV.'s physician, appearing in your issue of April 21st, obviously contains a blunder. One wonders what reason Hutchins can have had for making him into an Italian, with a hung, drawn, and quartered name. "Alcobasse" is clearly the Gallicised form of Alcobaça, about 80 miles north of Lisbon. The Cistercian Abbey was founded by Affonso Henriques, the first king of Portugal, and in Henry IV.'s time it was one of the largest and most powerful monasteries in Europe. Nothing would be more natural than that a physician should be selected from the successors to the Arabian culture in the Iberian Peninsula, and, as it is stated that Peter was born in Portugal, there seems no reason to doubt that he was educated, if not born, at Alcobaça. There might even be a connexion between his name and that of King Peter, whose tomb is in the Abbey, and who died in 1367—45 years before Henry IV.'s physician was admitted Dean of Westminster. Certainly this was a period of the closest associations between England and Portugal, cemented by the Treaty of Windsor in 1386, and by the marriage of John of Gaunt's daughter, Phillipa of Lancaster, in the following year to King John of Portugal, who was made a Knight of the Garter by Henry IV. in 1400.

I am, Sir, yours faithfully,

ALAN G. BODMAN.

Lisbon Medical Mission, May 25th.

ORGANISED TREATMENT OF MOTOR ACCIDENTS

To the Editor of THE LANCET

SIR,—In your report (p. 1137) of my paper on this subject at the Royal Institute of Public Health congress there is one slip that might lead to misapprehension. I am quoted as comparing the modern orthopædic hospitals to the military special hospitals "where the services of surgeons skilled in dealing with head and chest injuries would be available."

What I was actually trying to convey was that the network of orthopædic schemes with their central hospitals, which now covers Britain, was suitable for the work corresponding to that of the special femur and orthopædic hospitals provided by the War Office in the period 1914–18, if only the cases could be evacuated to them in a similar manner. Regarding head and chest cases, I remarked that at present the distribution of surgeons specially skilled in their treatment seemed dictated by chance, and I suggested that in future appointments to the surgical staff of local general hospitals areas should combine to secure the services of such men in reasonable numbers.

I am, Sir, yours faithfully,

M. F. FORRESTER-BROWN, M.S., M.D.

Bath, Somerset, May 27th.

LEFT-HANDEDNESS

To the Editor of THE LANCET

SIR,—The paper on left-handedness by Dr. C. J. Macalister in your last issue (p. 1151) will be welcomed by all who, from medical or educational experience have learned the importance of some of the associations of sinistrality. The suggestion offered by Dr. Macalister that stammering of the type to which he referred was due to imperfect transposition of function in the centres of the two sides of the brain was definitely supported in an investigation on left-handedness in relation to speech defects which I carried out with children of school age. Nearly 5000 boys were examined by means of a series of uni-manual and bi-manual tests, tests for the dominant eye, &c. The different types of dextrality and sinistrality were recorded on Rife's scheme (Psychological Review, 1922, xxix., 474). It was found that the tendency to speech disturbance was definitely related to departure from uni-laterality of function in the native organisation of the nervous system. Taking the whole of the subjects I found that in pure types for handedness (that is, RRR and LLL in Rife's scheme), 2·01 per cent. suffered from speech defects, whereas in the mixed types (LLR, LRR, RRL, and RLL), 11·8 per cent. suffered from speech defects.

"Crossing," which is probably the result of "partial or repressed transposition of the cerebral function," I found definitely increased the tendency to speech defect. All cases of pure dextrals with speech defects were submitted to eye tests and 41·4 per cent. were found to be left-eyed. In addition to the tendency, which others have suggested and this investigation supports, for sinistrality to be associated with a higher proportion of speech disturbances, my results proved that crossing, whether sinistrals with dextro-ocularity or dextrals with sinistro-ocularity, apparently increases the tendency to speech disturbance. If mixed types and crossing are related to imperfect transposition of function to which Dr. Macalister refers, then our data supports his contention. It was also found that nervous disability was two and a half times as frequent in the crossed groups as in the non-crossed groups. This tended to support Quinlan's hypothesis (Arch. Neur. and Psychiat., 1922, vii., 352) that such crossed functioning is evidence of a psychopathic constitution.

Reference is made to cases of "left-handed children who only began to stammer when an attempt was made to convert them into right-hand writers." It would appear from evidence that has been accumulated by various workers on the question that forced change of hand, may, or may not, cause speech defect. I suggest that this is fundamentally related to asymmetry of native organisation, and may be explained on the lines of the hypothesis I offered (Forum of Education, June 2nd, 1929) that speech defect is causally related to mixed types of sinistrality. The suggestion that partial or repressed transposition of the cerebral function "had given no trouble until the upsetting of the balance had been brought about by fright or emotional causes" is in close accord with the theory suggested by Dr. W. S. Inman (THE LANCET, 1924, ii., 211) that left-handedness and stammer have a common origin in some form of mental stress. The left-handed person is "often distinguished by being, to a greater degree than his fellows, self-reliant, critical, and obstinate, refusing to be driven but accepting guidance from those he loves." The forcible restraint upon left-handedness may, therefore, involve psychological difficulties of the greatest importance.

I am, Sir, yours faithfully,

DAVID W. OATES.

Newport (Mon.) Secondary School for Boys, May 29th.

HOSPITAL MANAGEMENT

To the Editor of THE LANCET

SIR,—In THE LANCET of March 31st (p. 704) Mr. Duncan Fitzwilliams is reported to have stated:—"that medical schools played an important part in the hospital system but did not make up the whole of it. The pride of the profession in the voluntary system had gone hand-in-hand with a neglect to study hospital management. Hospitals were governed by the finance subcommittee, which in turn was governed by the amount of its bank balance, and every finding of this subcommittee was passed by the complaisant board. The King's Fund had done most to improve matters; the statutory committee had produced an excellent survey, the British Hospitals Association had done nothing at all. . . ."

I have written twice to Mr. Fitzwilliams asking him to let me know upon what grounds he has stated publicly that "the British Hospitals Association had done nothing at all." I have not had the courtesy of a reply.—I am, Sir, yours faithfully,

R. H. P. ORDE,

Hon. Sec. British Hospitals Association.

Grosvenor-crescent, S.W., May 24th.

CHILDREN'S HOSPITALS.—The report for 1933 of the Hospital for Sick Children, Great Ormond-street, shows that 6723 in-patients were admitted, the average number of beds occupied daily was 226, the average weekly cost of each in-patient was £4 1*s.* 1*d.*, and the average total cost of each in-patient was £7 1*s.* 10*d.* There were 28,484 new out-patients whose average cost was 8*s.* 9*d.* A fall in the number of both classes of patients may, it is suggested, be attributed to the higher general standard of health. During the year only £11,655 was collected towards the cost of reconstruction, whereas the board had set out to raise £500,000. The rebuilding of the nurses' home is nearly complete, and an extension of the out-patient department, including a new electrotherapeutic department, has been made.

At the annual meeting of the Victoria Hospital for Children, Chelsea, it was pointed out that while the maintenance of the institution and the convalescent home at Broadstairs costs £25,000 a year, the income from investments is less than £3500. The hospital is anxious to enlarge its accommodation, but it "has never embarked on building operations without the money to pay for them."

Last year the Belgrave Hospital for Children, Clapham, received 1717 in-patients and treated 11,366 out-patients, a reduction in the latter category, attributed to the improved health of the locality and the fine weather. Thanks to legacies, income exceeded expenditure by £1280. The report states that the hospital is not large enough for the needs of the neighbourhood, that the out-patients' department is "lamentably overcrowded," and a nurses' home "an urgent necessity." The average weekly cost of each in-patient was £3 4*s.*

OBITUARY

ANDREW FULLERTON, M.D., M.Ch. Belf., F.R.C.S.I., C.B., C.M.G.

EMERITUS PROFESSOR OF SURGERY, QUEEN'S COLLEGE, BELFAST

WE regret to record the death of Prof. Fullerton, the well-known Belfast surgeon, which occurred on May 22nd in the sixty-sixth year of his age.

Andrew Fullerton was the third son of the late Rev. Alexander Fullerton, of Dalkey, was born in County Cavan, and was educated at Lurgan College, Belfast, proceeding for his medical training to Queen's College. He faced great difficulties in his early life, being an assistant to a Belfast practitioner while he was a student, and working late at night or early in the morning to keep level with his studies. His industry met with success, for, securing prizes and scholarships, he graduated as M.B., B.S. R.U.I. in 1890 with first-class honours. He now maintained himself by teaching anatomy and surgery and engaging in what general practice fell to him. He came to England and acted for a period as house surgeon at the Miller Hospital, Greenwich, and at the West Kent Hospital, Maidstone, but in 1898 he returned to Ireland, being appointed assistant surgeon to the Belfast Hospital for Sick Children. In 1902 he obtained the diploma of F.R.C.S.I., acted as demonstrator of anatomy at Queen's College, and was elected to the staff of the Royal Victoria Hospital, where he already held the Coulter exhibition. This was to be the main field of his surgical activities in the ensuing 41 years.

PROF. FULLERTON

[Photograph by Lafayette

Gradually his interests, though remaining broad, became focused on genito-urinary surgery, in which he rapidly became proficient, and on this sphere of his work we may quote the following communication received from Prof. R. J. Johnstone, who writes:

"When Andrew Fullerton became an assistant surgeon to the Royal Victoria Hospital urology was still, from the standpoint of to-day, in an embryonic stage. The electric cystoscope had been invented and was being used by a few enthusiasts, but it was regarded by most surgeons as merely another surgical toy. Fullerton saw the possibilities of the instrument, he set himself to learn how to use it and long hours of arduous practice made him its master. As one improvement followed another and the range and the scope of cystoscopy widened, he kept himself abreast, and, by the aid of the instrument of precision finally evolved, he was able to make those observations and to draw those deductions which have long ago given him an assured place among the leaders of modern urology. His attitude towards his own specialty was typical of the man. Whatever the subject with which he had to do, he was quite content to start as a novice and a learner, but he was never satisfied with anything less than mastery—the best of which he was capable, whether it was the performance of an operation, the delivery of a lecture or of a speech, or the achievement of a drive at golf. He had the passion for perfection, and that quality which has been held to be the mark of genius, an infinite capacity for taking pains."

In 1915 Fullerton went to France with the position of consulting surgeon to the B.E.F.; he was appointed to the Boulogne area in succession to the late Mr. F. F. Burghard, and there his special knowledge of urology and general surgical experience was an asset to the younger surgeons and surgical specialists in the area. In three and a half years' service he was awarded the C.B., C.M.G., and was mentioned thrice in dispatches. In France he came in contact with the McGill and Harvard University units, and after the war was invited to Canada and the United States, where he received the Honorary Fellowship of the American College of Surgeons.

In 1923 Andrew Fullerton succeeded Prof. Thomas Sinclair in the chair of surgery at Belfast, an office which he relinquished only last year. In 1926 he was elected President of the Royal College of Surgeons in Ireland and was reappointed the following year. A distinction which he prized most highly fell to him in 1931, when he was made President of the Association of Surgeons of Great Britain and Ireland. As a surgeon he was best known for his genito-urinary work. He was one of those who stressed the value of unilateral diuresis in obscure cases where other methods of examination proved negative. He modified the technique of prostatectomy from time to time and was a firm adherent to the Freyer type of operation with suprapubic enucleation at one stage, and had reduced his mortality to about 5 per cent. In his ward he took great pains with the case-notes and himself kept a record of both hospital and private cases. This extended back to his days as resident in hospital, and at the time of his death he had full records of some 3600 cystoscopies alone. No day was complete until he had written up his case-notes. As a writer he published over 50 papers of surgical interest, the articles on gunshot wounds of the kidney and ureter finding a place in the official medical records of the war.

With such a record it is not to be wondered that the man Andrew Fullerton had an arresting personality, and he possessed also a most likeable disposition. As in the war, so in civil life he was always kindly, considerate, and helpful to the student or young doctor who regarded him as a personal friend and loved him for his enthusiasm and guilelessness. His enthusiasm was infectious, and no one could work for him without sensing it and feeling the better for it. On his retirement his students gave him a remarkable testimony of their goodwill and devotion to a popular teacher. With all his activities Andrew Fullerton found time to enjoy his private life. He was a warm host and had a large circle of friends and was a prominent freemason. Golf was his chief recreation, and for the past two years he was captain of the Royal County Down Club at Newcastle.

Dr. J. C. Rankin writes appositely here:—

"Prof. Fullerton's operative and consulting work, together with his very careful and elaborate case-taking, left him with little time for other pursuits. His mind was always centred on his work, so that at times he may have seemed abrupt in his manner, but in lighter moods he could relax very completely.

At golf, his favourite recreation, he played keenly, never admitting defeat till the last put, and while a modest winner he was a most cheerful loser. At bridge, though his calls were at times optimistic, he brightened up the game and always made the best of his hand. He was an asset to any party, and, as generous host, he entertained many distinguished visitors to our school. In all he did he put his whole heart."

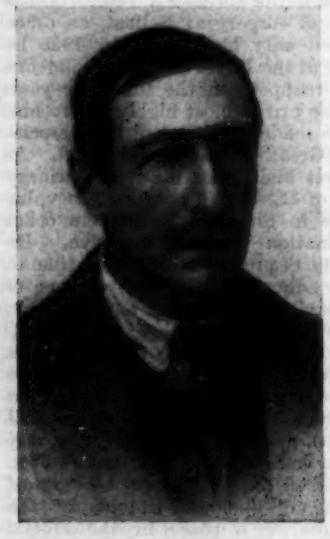
Prof. Fullerton was married twice, and is survived by his widow and the two sons and daughter of the first marriage.

OTTO JACKSON KAUFFMANN, M.D., F.R.C.P.

EMERITUS PROFESSOR OF MEDICINE, UNIVERSITY OF BIRMINGHAM

THE sudden death occurred on May 15th, at his house at Edgbaston, Birmingham, of Otto Kauffmann, emeritus professor of medicine and consulting physician to Queen's Hospital, Birmingham.

Otto Kauffmann when only 15 lost his father and was brought up by his mother, to whom he was devoted, and who lived with him until her death at the age of 89. He received his early education at Owens College, Manchester, and completed his medical curriculum at St. Mary's Hospital, London. Taking the M.R.C.S. in 1885, in the following year he graduated M.B. Lond. and M.B. Manch. Two years later he proceeded to the M.D. degree, London, when he qualified for the gold medal. He proceeded to hold many residential appointments; he was house physician at the Brompton Consumption Hospital, at the Seamen's Hospital, Greenwich, and at the Manchester Royal Infirmary, where he later became resident medical officer. In 1893 he was elected to the staff of Queen's Hospital, Birmingham, and his appointment to the chair of pathology attached to Mason University College followed.



PROF. KAUFFMANN

[Photograph by A. C. Cooper

For a long period he was a prominent figure in the medical school of the university, and in 1913 was elected professor of medicine, a post that he occupied with distinction for 13 years, during the closing period being chairman of the clinical board. This period corresponded with the years of the war, and while discharging his hospital and academic duties he did excellent work, with the rank of Lieut.-Colonel, R.A.M.C., at the first Southern General Hospital.

Kauffmann displayed in the Ingleby lectures, which were delivered in 1900 and published in these columns, his particular interest in many phases of neurology. He dealt with the common neuroses of childhood, and although much addition to our knowledge has been gained in the interval, his appreciation of the real nature of many of the conditions formed useful steps in the increasing comprehension of the causation of many of these neuroses. His observations were carried out in a thorough manner, and his main arguments remain sound. He was not a controversalist and relied for his teaching on his experiences in clinical medicine. In 1921 the Association of Physicians of Great Britain met at Birmingham, when election as president proved the opinion of his work formed by the leaders of scientific medicine. He also served the British Medical Association in many capacities, having been, at different annual meetings, vice-president of the section of pathology, while at the meeting in 1911, at Birmingham, he presided over the section of diseases of children.

The following appreciation comes from a colleague of Kauffmann: "It is permitted to comparatively few to have so little illness as clouded the 71 years of Otto Jackson Kauffmann's life. His good health was no doubt the secret of his youthful appearance. It will be a surprise to his friends to learn that he was born in 1863. He died, without suffering, from cerebral thrombosis in the midst of all his activities. He was a most gifted and cultured man with a very philosophical and analytical mind. He was a great reader, but the modern novel was anathema to him. Books on travel, biography, astronomy, and navigation interested him most, he was a great lover of Shakespeare, and well versed in French and German literature, both lay and medical. It is a matter of great regret that one so eminently fitted to write on medical subjects should have made so few contributions to the literature, but, perhaps, in becoming critical of others he had become too self-critical to express definite views. Mathematics and music are said to appeal to the same mentality and this was certainly true of Kauffmann. He was never happier than when engaged in trying to solve some mathematical problem, or when left to the companionship of his violin. He was a very keen violinist and for years had been in the habit of forming one of a quartette that met every week at his house.

"Kauffmann had an amazing command of English and would put this to good use whenever he spoke in public. He was an interesting lecturer but it was in the wards of the Queen's Hospital, Birmingham, that he was in his element. He always attracted a large number of students. To these he gave of his best and, as he was both thorough and methodical, his teaching was of the utmost value. He loved teaching and delighted in unravelling the medical problems that presented themselves in the wards. He visited the hospital on most days; Saturdays, however, never saw him there, for in the winter he hunted every Saturday and, for many years, he was a well-known figure at meets in the Midlands. He made up for his absence in the wards on the sixth day by his presence there on the seventh, and every Sunday morning would find Kauffmann in the wards surrounded by a number of practitioners discussing knotty medical problems. This Sunday meeting, to which he used to refer as his Sunday-school, may be said to have been the origin of post-graduate teaching so far as Birmingham is concerned. It was very popular with the doctors attending, but not so popular with the resident and nursing staffs, as may be readily imagined. His recreations were hunting in winter and yachting in summer. He sailed his yacht without paid hands and knew every mile of the coast of Cornwall, Devon, and the Scilly Isles, and many parts of Scotland and Ireland."

Professor Kauffmann married Rosalind, the granddaughter of Mr. Justice Crumpton, and leaves a widow, a daughter, and two sons, the elder of whom is training for the medical profession.

MEDICAL NEWS

University of Cambridge

On May 26th the following degrees were conferred :—

M.D.—W. S. Maclay, M. D. Nosworthy, R. W. Windle, and J. B. S. Lewis.

M.B. B.Chir.—G. W. Whittall and E. R. Hargreaves.

M.B.—J. G. Jones.

B.Chir.—C. M. Barker.

Dr. G N. Myers has been appointed university demonstrator in pharmacology, and Dr. H. A. Krebs in biochemistry.

The E. G. Fearnsides scholarship for clinical research on the organic diseases of the nervous system is open to men or women who are graduates of the university in medicine or who have passed part II. of the natural sciences tripos after graduation in arts. Applications should be sent to the university registrary before June 27th.

Society of Apothecaries of London

At recent examinations the following candidates were successful :—

Surgery.—P. E. Cresswell, Univ. of Oxf. and Guy's Hosp.; M. T. Curran, Univ. of Leeds; R. Fleming, London Hosp.; S. Kay, Univ. of Toronto; S. Klein, Univ. of Vienna and St. Mary's Hosp.; R. Sugerman, Univ. of Basle and Royal Free Hosp.; C. E. Wetherall, Royal Free Hosp.; and W. E. Whaite, Univ. of Manch.

Medicine.—P. C. Alexander, Univ. of Oxf. and Guy's Hosp. C. N. Chowdary, Univ. of Durham; G. W. Hardy, St. Mary's Hosp.; C. C. Joannides, Univ. of Graz and Westminster Hosp.; S. Kay, Univ. of Toronto; A. G. Manley, St. Mary's Hosp.; J. Mason, Middlesex Hosp.; S. E. Roberts, Guy's Hosp.; and E. C. Rowlands, St. George's Hosp.

Forensic Medicine.—P. C. Alexander, Univ. of Oxf. and Guy's Hosp.; F. M. Chalkley, Charing Cross Hosp.; M. V. Matthew, Univ. of Manch.; and M. A. Walsh Conway, Charing Cross Hosp.

Midwifery.—A. E. Ginn, Guy's Hosp.; L. A. Lewis, King's Coll. Hosp.; and H. Paroulakis, Univ. of Innsbruck and St. Mary's Hosp.

The following candidates, having completed the final examination, are granted the diploma of the society entitling them to practise medicine, surgery, and midwifery: P. C. Alexander, A. E. Ginn, G. W. Hardy, S. E. Roberts, E. C. Rowlands, R. Sugerman, and C. E. Wetherall.

University of London

Applications are invited for the Laura de Saliceto studentship for the advancement of cancer research. Particulars will be found in our advertisement columns.

University of Liverpool

Dr. Henry Cohen, lecturer in medicine in the university and physician to out-patients at the Liverpool Royal Infirmary, has been appointed to the chair of medicine as from Oct. 1st, in succession to Prof. John Hay, who retires at the end of the present session.

Dr. Cohen, who was born in 1900, was educated at Birkenhead Institution and Liverpool University, where he had a distinguished career as a student. He graduated as M.B. in 1922 with first-class honours and two years later proceeded to the M.D. degree, with special merit. After holding house appointments at the Royal Infirmary he became medical tutor and registrar there. He has held the Samuels research scholarship and in 1924 a Beit memorial research fellowship. In 1926 he was admitted to membership of the Royal College of Physicians of London, and this year he was elected a fellow.

International Anthropological Congress

The first session of the International Congress of Anthropological and Ethnological sciences will be held in London from July 30th to Aug. 4th. Meetings will take place at University College, Gower-street, W.C., and at the Wellcome Historical Medical Museum, Euston-road. The chairman of the section of anatomy and physical anthropology will be Prof. G. Elliot Smith, F.R.S, and the chairman of the section of sociology Prof. C. G. Seligman, F.R.S. The other sections will be devoted to psychology, demography and population problems, technology, religions, and language and writing. The president of the congress is Lord Onslow, and the secretaries should be addressed c/o The Royal Anthropological Institute, 52, Upper Bedford-place, W.C.1.

Vacation Course in Paris

A vacation course in medical therapeutics and hydrology will be held from June 18th to 30th at the Hôpital Necker, and a tour to Royat and Saint-Nectaire has been arranged for June 30th to July 1st. Further particulars may be had from the secretary of the faculty of medicine of the university. Prof. Maurice Villaret is acting as director.

Indian Medical Service Annual Dinner

This dinner, as already announced, will be held at the Trocadero Restaurant, London, on Wednesday, June 20th, at 7.15 for 7.30 P.M. Major Sir Leonard Rogers will preside, and officers can arrange to sit near their friends as separate tables to seat eight will be provided. Tickets from the joint hon. secretary, Sir Thomas Carey Evans, Hammersmith Hospital, Ducane-road, W.12.

Coming Sales of London Hospital Sites

Presiding at the annual court of governors of St. George's Hospital last week, Prince George stated that the site must be sold and a new building erected within the next four or five years. "Everything about the hospital except the wards," he added, "is out of date and quite unfit for modern requirements." Sir Crisp English, consulting surgeon to the hospital, urged immediate action on the ground that the institution is rapidly reaching a crisis. He described the site as "the best in London."—The site and buildings and the various annexes of Westminster Hospital are now bring advertised for sale.

National Birth Control Association

A conference on birth control for general nurses, public health workers, and midwives will be held at the College of Nursing, Henrietta-street, London, W., on Friday, June 15th. In the morning, under the chairmanship of Lord Horder, Mr. Claude Mullins will speak on the ethics of birth control, and Mrs. Stocks on birth control and the public health service. In the afternoon Lady Denman will take the chair, and Dr. Helena Wright will give a lecture on the technique of birth control, and Mr. Cedric Lane-Roberts on the contribution of the nursing profession. Tickets can be obtained from the secretary of the Association, 26, Eccleston-street, London, S.W.1.

Royal National Pension Fund for Nurses

At the annual meeting last week Sir Eric Hambro, the chairman, said that for the third year in succession the fund had made a record. Whereas in 1931 the policies issued numbered 1501, last year they reached 2438. The premium income in 1933 was £262,000, an increase largely due to many nurses having paid single premiums for the purchase of immediate or deferred annuities. Last year the single premiums amounted to £147,000. Sir Eric added that during the year the fund increased by £206,000, and on Dec. 31st last amounted to £2,700,000, of which £1,460,000—or more than 54 per cent.—was invested in British Government securities. The fund was now paying annuities at the rate of £144,000, and the number of annuitants was more than 4000. After deducting tax and allowing for refunds the net rate of interest earned for the year on the annuity and life fund was £4 18s. 3d. per cent.

Liverpool Hospital for Consumption and Diseases of the Chest

The report for 1933 of Dr. E. T. Baker-Bates, the stipendiary medical officer, shows that there were 131 patients under treatment (81 females and 50 males), whose average residence was 91 days. There were 98 "discharges," which included 25 deaths. On admission there were 78 per cent. of advanced, 18 per cent. of moderate, and only 4 per cent. of early cases. Advanced cases after admission "show a certain degree of improvement, hold their own for a time, and then gradually lose ground; such patients eventually become bedridden and helpless." The radiological examination of contact cases of pulmonary tuberculosis has been found to be of the greatest value.

PARLIAMENT

NOTES ON CURRENT TOPICS

Reassembly after Whitsun

THE House of Commons reassembled after the Whitsuntide recess on Tuesday, April 29th.

Milk for School-children

The Children's Minimum Organising Committee has circulated to Members of Parliament a memorandum criticising the Government's proposals for assisting the milk industry. The committee, which has the support of 32 organisations, emphasises the value of increasing consumption of liquid milk in schools as opposed to the encouragement of further production of milk for manufacture. The present proposals provide for the supply of milk to schools at ½d. for a third of a pint, and "it is estimated that under this scheme cheap milk could be supplied on schooldays to only 2–2½ million out of the 6½ million children attending elementary schools." Moreover, none would be available for children under 5 or for expectant and nursing mothers, or for school-children during the holidays. As an alternative the committee desires that "the Government should use whatever money is available as a direct grant to local education authorities to provide a daily ration of clean milk in elementary schools for all children who can take it." Local authorities should also be obliged to supply milk for children under 5 and for expectant and nursing mothers in households where the family income falls below a sum necessary to maintain full health. If this alternative is not adopted the committee urges that it shall at least be made compulsory on all local education authorities to supply free milk to necessitous children.

Restoration of Salary Cuts

On May 29th the House of Commons considered in Committee the Statutory Salaries (Restoration) Money Resolution.

Mr. CHAMBERLAIN (Chancellor of the Exchequer), in moving the resolution, said that abatements which were made in salaries and allowances in 1931 would be restored by one-half by administrative action where that was possible. Certain salaries, however, were fixed by Statute, which required legislation to restore abatements, and the resolution was moved to enable the legislation to be introduced. The first paragraph of the resolution went further than was necessary to restore half the abatements made in 1931, and would authorise a Bill to restore the other and second portion of the abatements at some future time, if it was thought desirable to do so, without the necessity for further legislation. There was no intention of restoring to the full all the cuts made in 1931 in this particular financial year. They would have to wait their turn until a full restoration could be made everywhere; then they would all come together.

The resolution was agreed to.

HOUSE OF COMMONS

TUESDAY, MAY 29TH

Duties on Scientific Publications

Captain CUNNINGHAM-REID asked the President of the Board of Trade if he would consider excluding from the operation of the Additional Import Duties (No. 6) Order, 1934, the publications of learned and scientific societies.—Mr. HORE-BELISHA (Financial Secretary to the Treasury) replied: The question of excluding the publications of learned and scientific societies from the operation of the Additional Import Duties (No. 6) Order, 1934, is one, in the first instance, for the consideration of the Import Duties Advisory Committee, to whom any representation should be made by the parties concerned.

Medical Diary

SOCIETIES

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

WEDNESDAY, June 6th.

Surgery. At the Mount Vernon Hospital, Northwood, 4.30 P.M. Demonstrations: Dr. Malcolm Donaldson, Mr. S. Cade, Mr. W. D. Harmer, Mr. G. L. Keynes, Mr. D. C. L. Fitzwilliams, Mr. B. W. Williams, Dr. G. C. Fairchild, and Dr. J. C. Mottram.

FRIDAY.

Ophthalmology. 5 P.M. (Cases at 4.30 P.M.) Annual General Meeting. Mr. A. C. Hudson and Sir William Lister: Hypernephroma of Iris. Miss M. A. Pugh: The Significance of False Projection in Squint. Cases will be shown.

Laryngology, Otology. Summer Meeting at Birmingham. 10 A.M.–12.30 P.M., at the Medical Institute: Discussion on the After-treatment of Facial Palsy to be opened by Sir Charles Ballance on Nerve Anastomosis, and Sir Harold Gillies on Treatment by Fascia Lata Slings. 2.30 P.M.–4.15 P.M. Mr. Steven Jones: Normal Phonation and Articulation. Mr. V. E. Negus: Disorders of Phonation. One demonstration: Miss Freda Parsons: Speech Re-education Methods.

SATURDAY.

9.30 A.M.–12.30 P.M., at the Board Room, General Hospital. Cases: Sir Harold Gillies, Mr. W. S. Thacker-Neville, Mr. C. Hamblen Thomas, Mr. Harold Round, and Prof. Lockhart.

RESEARCH DEFENCE SOCIETY.

TUESDAY, June 5th.—3 P.M. (at the London School of Hygiene and Tropical Medicine, Keppel-street, W.C.), Prof. J. Barcroft: Experiments on Man (Stephen Paget Memorial Lecture).

SOUTH-WEST LONDON MEDICAL SOCIETY.

WEDNESDAY, June 6th.—9 P.M. (at the Bolingbroke Hospital, Wandsworth), Mr. Comyns Berkeley: Some Things I Have Learnt (Bolingbroke Lecture).

BIOCHEMICAL SOCIETY.

FRIDAY, June 8th.—2.30 P.M. (Institute of Physiology, Glasgow): Communications.

SATURDAY.—Visit to Hannah Dairy Research Institute, Ayr, in the morning: and to Marine Biological Station, Millport, in the afternoon.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

ROYAL COLLEGE OF PHYSICIANS, Pall Mall East, S.W.

TUESDAY, June 5th, and following THURSDAY.—5 P.M., Prof. O. L. V. S. de Wesselow: On Arterial Hypertension (first two Croonian Lectures).

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, London, W.

MONDAY, June 4th, to SUNDAY, June 10th:—CHELSEA HOSPITAL FOR WOMEN, Arthur-street, S.W. All-day Course in Gynæcology.—LONDON LOCK HOSPITAL, 91, Dean-street, W. Afternoon Course in Venereal Disease.—CITY OF LONDON MATERNITY HOSPITAL, City-road, E.C. Week-end Course in Obstetrics: all day, Sat. and Sund.—MEDICAL SOCIETY OF LONDON, 11, Chandos-street, Cavendish-square, W. Lecture on Poor Circulation by Dr. A. E. Clark-Kennedy, at 2.30 P.M. on Tues.—NATIONAL TEMPERANCE HOSPITAL, Hampstead-road, N.W. Lantern lecture-demonstration on surgical cases by Mr. Hamilton Bailey at 3 P.M. on Sat.—PANEL OF TEACHERS. Individual clinics in various branches of medicine and surgery are available daily. Courses of instruction arranged by the Fellowship of Medicine are open only to Members and Associates.

UNIVERSITY OF BIRMINGHAM.

TUESDAY, June 5th.—3.30 to 5 P.M. (at the General Hospital), Prof. Seymour Barling: Demonstration of Surgical Cases.

FRIDAY.—3.30 to 5 P.M., Dr. Hugh Donovan: Urinary Infections and the Ketogenic Diet.

LEEDS GENERAL INFIRMARY.

TUESDAY, June 5th.—3.30 P.M., Dr. Vining: Children.

DONATIONS AND BEQUESTS.—From Smith's Charity the Royal National Orthopædic Hospital has received a donation of £1000, and King's College Hospital from the same charity a special grant of £500 towards the completion of the nurses' home, and a gift from a citizen of Lambeth of £1000 towards the reduction of the debt of over £60,000.—By the will of the late Dr. J. T. Rogerson, of the Isle of Man, the Victoria University of Manchester will receive ten £100 five per cent. first mortgage debentures of the Trafford Park Estates, Ltd., and benefit by part of the residue of the estate.—The late Mrs. Mary G. Letford, of Ramsgate, left £1000 to the Star and Garter Home for Disabled Soldiers and Sailors, Richmond, to endow "The Louis George Letford Bed," and £500 to the Ramsgate General Hospital and Seaman's Infirmary to endow "The Louisa Worthington Cot."

Appointments

KIRBY, M., M.B., Ch.B. N.U.I., has been appointed Asst. County M.O.H., Dublin.

MILL, W. A., M.S. Lond., F.R.C.S. Eng., Laryngologist to the Cancer Hospital (Free).

MONCRIEFF, ALAN A., M.D., F.R.C.P. Lond., Physician to Out-patients, at the Hospital for Sick Children, Great Ormond-street, London, W.C.

RISK, R. S., M.B., B.S. Lond., Resident Medical Officer at the Queen's Hospital for Children, Hackney-road, E.

SIMPSON-SMITH, A., M.Chir. Camb., F.R.C.S. Eng., Surgeon to the Hospital for Sick Children, Great Ormond-street, London, W.C.

West London Hospital: GORDON, H., B.Chir. Camb., Dermatologist; and HASLER, J. K., M.B., B.S. Lond., Assistant Anæsthetist.

Certifying Surgeons under the Factory and Workshop Acts: ASHTON, J. C., M.B., Ch.B. Edin. (Corris, Montgomeryshire); and HOW, G. R., M.B., Ch.B., St. And. (Kilbirnie, Ayrshire).

Vacancies

For further information refer to the advertisement columns

Bagdad, Royal College of Medicine.—Chair of Materia Medica.
Bath, Royal United Hospital.—Hon. Med. Reg.
Beckenham, Bethlem Royal Orchard, Monks Orchard.—Sen. Asst. Phys. £700.
Blackburn Royal Infirmary.—Res. Cas. O. £150.
Bristol Royal Infirmary.—Hon. Physician, Hon. Asst. Phy., Hon. Reg. to Orthopædic Dept. Also Hon. Anæsthetist.
Bristol, Winford Orthopædic Hospital.—Hon. Dental Surgeon.
Cambridge University.—E. G. Fearnside's Scholarship for Clinical Research, &c.
Cancer Hospital, Fulham-road, S.W.—H.S. At rate of £100. Also Second Asst. Pathologist. £250.
Cardiff Royal Infirmary.—H.S. for Ear, Nose, and Throat Dept. £100.
Central London Throat, Nose, and Ear Hospital, Gray's Inn-road, W.C.—Assts. for Out-Patient Dept.
Charing Cross Hospital Institute of Pathology, W.C.—Part-time Bacteriologist and Hæmatologist. At rate of £250.
Chesterfield, Walton Sanatorium.—Locum Res. Asst. M.O. At rate of £350.
Connaught Hospital, Walthamstow, E.—H.S. At rate of £100.
Dewsbury and District Infirmary.—H.S. £150.
Dreadnought Hospital, Greenwich, S.E.—H.P. and H.S. At rate of £110.
Durham C.C.—District Tuber. M.O. £500.
Evelina Hospital for Sick Children, Southwark, S.E.—H.P. At rate of £120.
Gloucester, Gloucestershire Royal Infirmary, &c.—Res. H.P. and Res. H.S. Each at rate of £150.
Great Yarmouth General Hospital.—H.S. £140.
Guy's Hospital, London, S.E.—Asst. M.O. to Salomon's Infant Welfare Centre. At rate of £78. Also Ophthalmic Surgeon.
Hampstead General and N.W. London Hospital, Haverstock Hill, N.W.—H.S. At rate of £100.
Hampstead Metropolitan Borough.—Public Vaccinator.
Hospital for Sick Children, Great Ormond-street, W.C.—Physician to Skin Department.
Hospital for Tropical Diseases, Gordon-street, W.C.—H.P. At rate of £120.
Hull Royal Infirmary.—Third H.S. At rate of £150.
Ilford, King George Hospital.—Cas. O. At rate of £130.
Ipswich, East Suffolk and Ipswich Hospital.—H.P. £120.
Lancashire C.C., School Medical and Child Welfare Dept.—M.O. £800.
Lancaster, Royal Albert Institution for the Feeble-minded.—Jun. Asst. M.O. £430.
L.C.C.—Radiologist. £1500.
London Hospital, E.—Physician.
London Missionary Society.—Medical Woman for Jiaganj, N. India.
London University.—Chair of Obstetrics and Gynæcology. £2000. Also Examinerships. Also Laura de Saliceto Studentship. £150.
Manchester Northern Hospital for Women and Children.—Jun. H.S. £100.
Manchester Royal Children's Hospital.—Asst. Surgeon. £50.
Mansfield, Notts, Harlow Wood Orthopædic Hospital.—Two H.S.'s. Each at rate of £175.
Metropolitan Ear, Nose, and Throat Hospital, 2, Fitzroy-square, W.—Asst. Surgeon.
Middlesbrough, North Riding Infirmary.—H.P. At rate of £125.
Mildmay Mission Hospital, Austin-street, Bethnal Green.—Asst. Cas. O. At rate of £125. Also Jun. Res. M.O. At rate of £100.
Nelson Hospital, Merton, S.W.—Res. H.S. At rate of £100.
Norwich, Norfolk and Norwich Hospital.—H.P., H.S., and H.S. to Spec. Depts. Each £120.
Penshurst, Cassel Hospital for Functional Nervous Disorders, Swaylands.—Medical Director. £1000.
Plymouth, South Devon and East Cornwall Hospital.—H.P. and H.S. Each at rate of £120.
Preston County Borough.—Asst. School M.O. £500.
Queen Charlotte's Maternity Hospital, Marylebone-road, N.W.—Two Res. Anæsthetists. Each £100.
Queen's Hospital for Children, Hackney, E.—H.P. and Cas. O. Each at rate of £100. Also Surgeon for Ear, Nose, and Throat Dept.
Royal Dental Hospital of London, Leicester-square, W.C.—Hon. Pathologist.
Royal London Ophthalmic Hospital, City-road, N.—Hon. Asst. Phys.
Royal Northern Hospital, Holloway, N.—H.S. At rate of £70.
Ryde, Royal Isle of Wight County Hospital.—Res. H.S. £180.
St. Peter's Hospital for Stone, Henrietta-street, W.C.—Hon. Clin. Assts. to Out-Patient Dept.
Salford Royal Hospital.—Med. Reg. £250. Also H.P. and H.S. Each at rate of £125.
Salvation Army, Mothers' Hospital, Lower Clapton-road, E.—Jun. Res. M.O. At rate of £80.
Sheffield Children's Hospital.—H.S. At rate of £100.
Sheffield, Jessop Hospital for Women.—Two H.S.'s. Each at rate of £100.
Stockport Infirmary.—H.S. £150.
Stoke-on-Trent, North Staffordshire Royal Infirmary.—Hon. Radiologist. Also H.S. At rate of £150.
Weir Hospital, Grove-road, Balham, S.W.—Jun. Res. M.O. £100.
Western Ophthalmic Hospital, Marylebone-road, N.W.—Jun. Res. H.S. At rate of £100.
West London Hospital, Hammersmith-road, W.—H.P., H.S. and Res. Anæsthetist. Each at rate of £100.
Wigan Royal Infirmary.—H.S. At rate of £150.
Winchester Royal Hampshire County Hospital.—H.S. At rate of £125.
Wolverhampton Royal Hospital.—H.S. for Ear, Throat, and Nose Dept. At rate of £100.
Wolverhampton and Midland Counties Eye Infirmary.—H.S. £150.
Wolverhampton, New Cross Hospital.—Asst. Res. M.O. £200.

The Chief Inspector of Factories announces vacant appointments for Certifying Factory Surgeons at Oakengates, Salop, and at Filey, Yorks.

Births, Marriages, and Deaths

BIRTHS

BAYNES.—On May 21st, at Reed House, Old-avenue, West Byfleet, the wife of Dr. H. Godwin Baynes, of a son.

DARLEY.—On May 23rd, at Trory Cottage, Claygate, Surrey, the wife of Rupert D. Darley, M.B., B.S. Lond., of a daughter.

GIBSON.—On May 26th, at Muntham, Torquay, the wife of P. C. Gibson, M.D., of a daughter.

LANGMAID.—On May 25th, at Southsea, the wife of Dr. F. Rodney Langmaid, of a son.

MCLAGGAN.—On May 30th, 1934, at 27, Welbeck-street, to Elsa, wife of J. Douglas McLaggan, F.R.C.S.—a son.

MORLAND.—On May 27th, at Cook's Hill, Mundesley, the wife of Andrew Morland, M.D., of a son.

OWEN.—On May 24th, the wife of Charles Langley Owen, F.R.C.S. Eng., of Tregony, Cornwall Gardens, Cliftonville, of a daughter.

POLSON.—On May 24th, at the Imperial Nursing Home, Harrogate, the wife of Dr. Cyril Polson, of a daughter.

RATCLIFFE.—On May 22nd, the wife of James Rudd Ratcliffe, F.R.C.S. Eng., of Derby, of a son.

MARRIAGES

GRAHAM—BATSON.—On May 24th, in London, C. I. Graham, F.R.C.S., to Evelyn Marjorie Batson, of Rodwell, Weymouth second daughter of the late Dr. and Mrs. W. L. Batson, of Dorking.

DEATHS

COOKE.—On May 23rd, at Alverthorpe, Ripley-road, Worthing, Dr. John Benson-Cooke, aged 82.

FULLERTON.—On May 22nd, Andrew Fullerton, C.B., C.M.G., F.R.C.S.I., of University-square, Belfast.

HURLBUTT.—On May 25th, at Collingham-road, S.W., Spencer Hurlbutt, M.R.C.S., L.R.C.P.

KAUFFMANN.—On May 15th, after a very short illness, at his residence, Hermitage-road, Edgbaston, Birmingham, Otto Jackson Kauffmann, M.D., F.R.C.P., Emeritus Professor of Medicine, University of Birmingham, aged 71 years.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

KENT AND CANTERBURY HOSPITAL.—It has been decided to rebuild this hospital with about 150 beds on a site at South Canterbury at a cost roughly estimated at £100,000, of which it is expected that £84,000 will be available by the end of this year. The scheme includes beds for paying patients and a nurses' home to accommodate the entire nursing staff; the nurses are at present "billeted all over the city." Dr. Harold Wacher describes the present out-patient department as "chaos" and the dental, bacteriological, and orthopædic departments as housed in "miserable buildings showing ominous signs of decay."

NOTES, COMMENTS, AND ABSTRACTS

A SURGICAL PILGRIMAGE TO ROME

BY H. S. SOUTTAR, C.B.E., F.R.C.S.
SURGEON TO THE LONDON HOSPITAL

IT is always difficult to assess the value of an experience or to define precisely what it has taught us, and in nothing is this more striking than in a visit to a foreign clinic. We see a number of hospitals quite different from our own, and doctors working under conditions as foreign to us as are their countries, and one perhaps watches a series of operations and admires the dexterity and success with which they are performed. Perhaps one picks up a few ideas on organisation, or hints for an improved technique, but one comes away with a feeling that one has gained something of greater importance than such details as these, something indefinable and incommunicable which has made the journey well worth while.

This was undoubtedly true of a small party of Pilgrim Surgeons who left London one morning last February on a visit to Rome. Early on Monday morning, after 32 hours' travelling, we met Prof. R. Bastianelli at his private clinic in the Viale Regina Margherita. We were taken to his library surrounded by surgical journals in every language, and we were shown a series of perfect case records extending back over many years. We were introduced to the secretary-artist who keeps the records and makes coloured drawings of all the more important cases. The drawings were all of exceptional perfection and formed a fitting record of a splendid surgical technique. The clinic is the private property of Prof. Bastianelli, it contains 50 beds and is fitted with the most modern equipment in every direction. It is staffed by three assistants and a large nursing establishment.

Prof. Bastianelli performed an operation upon an old case of suppurative cholecystitis with perforation of the duodenum and colon. The case was one of great difficulty and the gall-bladder was removed with remarkable skill under perfect local anæsthesia. This was followed by a gastrectomy for duodenal ulcer. An interesting point in technique was the stripping of the vessels from the greater curvature and the separate ligature of the anterior and posterior groups. A great point was made of the actual removal of the ulcer, accomplished with some difficulty, since it had involved the pancreas. The duodenal stump was closed and a retrocolic Polya anastomosis performed. This operation also was under local anæsthesia.

Tuesday morning we spent at the Policlinico Umberto I with Prof. R. Alessandri. This enormous hospital with over 2000 beds was opened 35 years ago, and the writer actually saw it before it was opened. It was then intended to take 4000 patients, and it was rightly regarded as one of the medical wonders of the world, built on the pavilion system on a single corridor 900 metres in length. It was then thought that it would never be filled and the number of beds was curtailed, but so rapidly has Rome advanced that it is now considered quite inadequate to its needs and has been supplemented by several other large hospitals. We saw three operations performed by Prof. Alessandri under local or regional anæsthesia. The first was an exploration of the parathyroids in a case of spondylitis ossificans, on which disease Prof. Alessandri has done some interesting work. This was followed by a cholecystectomy under local anæsthesia, and a nephrectomy for a tuberculous kidney under extradural anæsthesia produced by the injection of 1 in 1000 solution of percaine in the upper lumbar region outside the dura.

After the operations we were taken to a fine lecture theatre where we were shown a series of cinematograph films illustrating points in operative technique. We were told that the university possesses a large stock of these films and that they are extensively used in teaching students.

On Wednesday morning we visited the Istituto Regina Helena, called the "House of Tumours," and devoted to the study of the causation and treatment of tumours of every kind. It is really a complete hospital with 250 beds arranged in small wards and private rooms. There is an X ray department complete in itself for early diagnosis and treatment, and both the hospital and its X ray department are equipped in a most lavish and up-to-date manner. Attached to this is a research institution with facilities for experimental research of every kind. The roof is devoted to animal houses, and one large room is specially equipped for culture of living tissues. Although the laboratories are already complete, the only appointment so far made is that of Prof. Bastianelli to the directorship. In the hospital itself we were specially impressed by the X ray department equipped with double diagnostic sets of the latest type, and with double treatment sets operating at 250 k.v.

From here we went on to the Ospedale di Littore where we met Prof. A. Chiasserini. We saw him perform an extraperitonal resection of the left lumbar sympathetic in which he obtained an admirable exposure through an oblique lateral incision, and a laparotomy for a duodenal ulcer. He afterwards showed us a large number of specimens of gastrectomy, an operation which he invariably performs for all duodenal as well as gastric ulcers. We saw several of his cases of recent date and were much impressed by the results.

In the evening we had the pleasure of entertaining at dinner a few of the leading medical men of Rome, when Prof. G. E. Gask, who was the leader of our party, gave a message of greeting from the President of the Royal College of Surgeons of England to Profs. Bastianelli and Alessandri, honorary Fellows of the College. Prof. Bastianelli replied in a charming speech, in which he congratulated the Pilgrims on having at last found in Rome a true object for their pilgrimage.

The Pilgrims returned full of enthusiasm for all that they had seen and for the kindness with which they had been received on every hand.

Looking back over 35 years to a former visit, I found Rome itself to show many changes. The beggars and the slums have gone and everywhere one sees evidences of a new life and of a new spirit. No city in the world can point to the memory of such a glorious past; may the future hold for her an equal prosperity.

A MUNICIPAL CHILDREN'S HOSPITAL

EVER since the supersession of the boards of guardians the county borough of Middlesbrough has been at work upon a comprehensive scheme of reorganisation of the town's hospital and kindred services. Among its inheritances from the guardians was the Broomlands (Children's) Hospital, then more than 30 years old, which it soon became evident could be made to serve its purpose efficiently only by a serious expenditure. There was, however, another and more promising building in the possession of the town council which it was decided to modernise and adapt as a children's hospital. This has now been done at a cost of £2500, and the new institution was opened last week. The exterior of the building is admittedly rather grim, and it might have been supposed that its first vicissitudes would make its conversion a matter of difficulty. Originally two buildings erected as children's homes, there was a surrounding high wall which did not make for cheerfulness. Presently the wall was demolished, and, going from one end of life to the other, the building became a home for aged women. After the war it was leased by the corporation from the guardians and turned into flats, but eventually the tenants jibbed at the high rents which, in the end, they refused to pay. Then the guardians used it as a hospital for midwifery and

female medical cases until that body receded into history.

The adaptation has been skilfully accomplished, and the building now contains four ground-floor wards, two large and two small, which can be converted into open-air wards by opening the French windows, five small wards and a large one on the first floor with an operating theatre and the necessary accompaniments of a complete hospital on a small scale, including a plaster room and an operating theatre. The building looks out upon a lawn, and there is a veranda for camp beds that delicate children may obtain all the available sunlight and fresh air. The wards, which will accommodate 82 beds, are painted in varying pastel shades and have oak floors. An essential part of the hospital is a school with a fully qualified whole-time teacher who holds classes in the wards for cases of long duration. It is claimed that the hospital will substantially reduce the cost of administration, and it certainly appears to be a promising example of what can be done by the coördination of hospital activities.

PREVALENCE OF CONTRACEPTIVE METHODS

THE reports of the International Medical Group for the Investigation of Contraception take stock periodically of the progress of birth-control knowledge throughout the world. In the current issue, the fifth of the series,[1] the contributions treat of developments, both in the technique of contraception and in knowledge of the distribution of its practice, that have occurred in Great Britain, the United States, Denmark, and Russia since the publication of the previous report in 1931; and of the rise and overnight collapse of the birth-control movement in Germany within the same period.

Perhaps the most generally interesting, as it certainly is the most illuminating, contribution is the full summary by Dr. C. P. Blacker—who, as secretary to the Birth Control Investigation Committee, is responsible for the report—of three statistical studies which deal with the contraceptive practices of a group of English women (mainly middle-class), and of two groups of women in America, one belonging to the relatively intelligent and educable class that avails itself of the services of birth control clinics, the other a group of women who had been delivered of babies in maternity hospitals and belonged for the most part to the poorest and least literate elements of society. In the English group, a method of which the sheath was an important component was used more frequently than any other; coitus interruptus came next in frequency; the rubber cap next; and then quinine pessaries. The most striking contrast between the two American groups is in the fact that, whereas over 90 per cent. of the clinic group had previously used one or more contraceptive methods, only 30 per cent. of the poorer, less educated group had done so.

In the clinic group the most favoured previous method was coitus interruptus, and next in order of frequency were douching with a diversity of medicated solutions, the sheath, soluble pessaries, and sponges. The chief contraceptive devices of the maternity hospitals group were, in order of frequency, the sheath, douching with medicated solutions, coitus interruptus, and douching with plain water. Considering the economic level of this group, it is surprising that coitus interruptus (which costs nothing) did not come first in order of frequency, its prevalence—i.e., in 17·4 per cent. of the cases—being in fact lower than in any other English or American group that has formed the subject of a similar inquiry. Soluble pessaries were low and rubber pessaries even lower in the list, perhaps owing to the inflated retail prices of the former and the skill required for the correct application of the latter; but it is not improbable that women who adopted methods involving the use of these devices would be less likely than others of their social class to appear in the records of maternity hospitals. This latter explanation is certainly borne out by Dr. Hannah Stone's study of the contraceptive successes and failures of 2000 patients of the Maternal Health Centre, Newark, New Jersey, which tends to the conclusion that "if a woman scrupulously fulfils the instructions attaching to the use of the Dutch pessary combination, there will be about one chance in 100 of its failure in the course of a year, or approximately one chance in 5000 of its failing at each act of coitus." Similar results are recorded by the leading English clinics, wherein the proportion of failures is about 5 per cent.

One, at first sight, surprising fact brought out by Dr. Stone's statistical analysis is that douches of plain water have a higher record of successes than douches containing spermicidal substances. It seems probable that the effectiveness of post-coital douching as a contraceptive measure depends to some extent on a time-factor—varying inversely with the interval that is allowed to elapse between coitus and taking the douche. The greater success of plain water is thus explained by its being available at once, whereas the preparation of medicated solutions may result in the loss of valuable time.

[1] Obtainable from the Hon. Secretary, Birth Control Investigation Committee, 26, Eccleston-street, London, S.W.1. 2s.

PUBLIC SCHOOLS YEAR BOOK FOR 1934

THE forty-fifth issue of this year book—it was first issued in 1889, and became connected with the Headmasters' Conference in 1910—is something of a landmark, for it presents for the first time details of the leading preparatory schools; there is thus available under one cover official information regarding a large and important section of the national system of education. To avoid misunderstanding, however, the editors of the year book desire to make it clear that it does not purport to give information about all the public schools in the country but only those which are eligible for representation on the Headmasters' Conference. Besides this directory there is a large section dealing with careers in which parents, schoolmasters, and boys can find first-hand and trustworthy information about the navy, army, civil service, colonial services, and the various professions. Communications about the year book should be addressed to the Managing Editor, P.S.Y.B., 31, Museum-street, London, W.C. 1. The price is 10*s.* 6*d.*

BILHARZIAL APPENDICITIS

IT is now realised that in tropical medicine a great variety of affections of the vermiform appendix may be distinguished. There is undoubtedly a form of amœbic ulceration which may lead to perforation and this has been recognised in Egypt as well as in India and Malaya. Then again in malaria, and especially in the subtertian form, the appendix may be the seat of the pain due to blockage of the venules with sporulating parasites. The appendix, too, forms a resting-place for many intestinal worms; the round-worm may invade the lumen, as in the case recorded in our issue of Jan. 6th (p. 51) by Dr. H. E. S. Stiven, and the threadworm, oxyuris, is frequently found there also.

In bilharziasis the eggs of the parasite are very often deposited in the appendix and may give rise to a tumour of considerable size, exciting the symptoms of appendicitis, as has happened in many of the reported cases of infection with *Bilharzia japonica*. Interesting pathological specimens collected by the late A. R. Ferguson are to be seen in Cairo, and it appears that both species of bilharzia (*B. hæmatobia* and *B. mansoni*) can cause these tumours. Dr. Moh. Abdel Monem El Diwany (Jour. Egypt. Med. Assoc., March, 1934, p. 285) in describing the symptoms of this affection, shows that these do not differ much from the signs of chronic appendicitis. The tenderness over McBurney's point is not of much assistance except in the acute attack. Usually the appendix can be easily palpated and there is slight leucocytosis (10,000) with a definite increase of eosinophil cells. After operation treatment should be continued by means of intravenous injections of tartar emetic.

A MIXED BAG

Sir William Hodgson is to be congratulated not only on his eightieth birthday but also on the birthday present which he has received from his fellow-practitioners in Cheshire. "Fasciculus Cestriensis" is a collection of short articles mainly therapeutic and largely, but not entirely, written by general practitioners. A rough-and-ready technique for tracheotomy, the use of turnip-juice in whooping-cough, the cleansing of a coated tongue with fresh pineapple, the improvisation of a catheter, the treatment of lupus vulgaris with permanganate of potash and of alopecia areata with methylated chloroform and oil of cade, are only a few of the practical points dealt with in this fascinating book.

The general practitioner's therapeutic armamentarium is culled from divers sources. If he is humble and sensible he will learn from all with whom his work brings him in contact, from the consultant on the one hand to the "wise woman" on the other. Doubtless some of his knowledge is mere superstition and much of it unscientific. Being so often unable to carry out control experiments, he is a frequent victim to the fallacy of post-hoc propter-hoc. Nevertheless, it sometimes happens, especially in cases of chronic disease, that neither the text-book nor the consultant can help him and, being thrown on his own resources, he remembers John Hunter's dictum, "Don't think—try." In the course of a professional lifetime he must discover something of value to medicine, especially to therapeutics, and the "Fasciculus Cestriensis" proves it. Sir William Hodgson has inspired the Cheshire panel committee, ably backed up by the Cheshire doctors, to make an attempt to pool their collective wisdom.

It is an example which might well be followed by other counties.

RADIOTHERAPY IN TUBERCULOUS MENINGITIS

Two years ago Prof. Z. von Bókay, of Debreczen, in Hungary, reported the treatment of 17 cases of tuberculous meningitis with deep X rays (see THE LANCET, 1932, i., 894). The diagnosis had been made by finding tubercle bacilli in the cerebro-spinal fluid or in an inoculated guinea-pig, and five recoveries were claimed—in children between 3 and 12 years of age. As the condition is almost always fatal under ordinary circumstances these findings aroused much interest and several attempts have been made to repeat the observations. M. Faberi and C. Fumi, from the institute of clinical pædiatrics of the University of Rome, review (Policlin., April 23rd, 1934, p. 608) the results obtained and add particulars of nine cases treated by themselves according to Bókay's technique. In all they give particulars of 29 cases (including several in which there was evidence of miliary dissemination) in which the diagnosis had been established and deep X ray therapy was employed. It is unfortunately only too easy to summarise the results obtained, since in every case the patient died, and in several of them it was thought that the course of the disease had if anything been accelerated by the remedy.

CONTROL OF EPIDEMICS IN CHINA

THE reports for the year 1932 of the National Quarantine Service of China are to hand in a volume of some 330 pages, with many illustrations. While much of the detail concerns port sanitary workers only, the account of the cholera epidemic of 1932 in which some 94,000 cases occurred with 31,000 deaths is of considerable general interest. Among the facts disclosed is that in Shanghai the death-rate among Chinese (4221 cases) was 7·06 per cent., and among foreigners (75 cases), 26·6 per cent.—a difference attributed by the authors to early hospitalisation of the Chinese. In neighbouring war-stricken towns where no hospital facilities were available a fatality-rate of 44 per cent. is recorded (212 cases). Chapters are also included on an epidemic of small-pox in Amoy; on a new survey of plague in wild rodents; on a rat-flea survey of Shanghai; and on the present status of the leprosy question in China. The year was a very difficult one since the work was disorganised in Shanghai and the quarantine station was destroyed in the Japanese attack on the city. The Plague Prevention Service in Manchuria was driven south of the Great Wall when the Japanese occupied that province. Nevertheless, much valuable work seems to have been accomplished and it is admirably reported. The records are edited by Dr. Wu Lien-Teh (Tuck), director of the Service, and Dr. Wu Chang-Yao.

NEW PREPARATIONS

MINADEX.—From the Glaxo Laboratories (Osnaburgh-street, London, W.) we have received a syrup having the following formula for each fluid ounce:—

	Grains.		Grains.
Ferr. et am. cit. (vir.)	14	Sod. glycerophos...	1/10th
Calc. glycerophos. ..	2	Mang. glycerophos.	1/25th
Pot. glycerophos. ..	1/5th	Cupr. sulph. ..	1/25th

The content of vitamins A and D for each fluid ounce are claimed to be higher than that in the same quantity of medicinal cod-liver oil. The well-known therapeutic action of iron and the other salts and the vitamin content lead the proprietors to allude to the preparation as a threefold tonic. The tonic properties are obvious, while the suggested dosage ranges from half a teaspoonful for little children up to two teaspoonfuls, according to age, for adults, but the wise direction is printed on the bottle that Minadex is to be given only as a physician directs.

SAGRADOL.—The Angier Chemical Co., Ltd. (86, Clerkenwell-road, London, E.C.), have put on the market a new remedy for constipation, a combination of mineral oil and cascara sagrada, and they believe that the blend, which has been difficult to obtain in perfect balance, is a stable product. The peristaltic action of cascara synchronising with the moistening and softening results of the oil ingested, lead to an easy purgation and there should be considerable demand for the preparation. Clinical evidence concerning patients suffering severely from constipation indicates that a soft and normal stool may be produced in stubborn conditions of the bowel where harsher cathartics have been ineffective. For this reason the preparation has been used successfully in the constipation of pregnancy.

CHILD MARRIAGE

FEW will be able to read unmoved the graphic account of the evils of child marriage given by Miss Rathbone in a little book recently issued.[1] Some may disagree with the attribution of blame, and some may see little hope in the proposed remedies; but that the social customs of India inflict unnecessary suffering upon little girls is hardly to be doubted.

Miss Rathbone explains and describes the Joshi Report on Child Marriage and discusses the Sarda Act, the disastrous delay in putting it into operation, and its non-observance at the present time. She examines the Census Report, with the population and vital statistics of the men and women of India, and then suggests remedies.

One hundred out of every thousand girl wives are likely to die in childbirth in first or later pregnancies; and out of every 100,000 children born alive, 45,000 die before the age of five. The expectation of life in India for men is 38·96 years, and for women only 36·75. Facts like these, culled from the Census Report, the Joshi Report, and from a dozen other medical and official sources tell their own depressing story.

The author's object is to arouse concern and responsibility among British readers, and the presentation is so vivid that she is not likely to fail to achieve this aim.

[1] Child Marriage: the Indian Minotaur. By Eleanor F. Rathbone, M.P. for the Combined English Universities. London: George Allen and Unwin. Pp. 138. 2s. 6d.